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Submitted via e-docket

U.S. Environmental Protection Agency
Docket Center (EPA/DC), (28221T)
1200 Pennsylvania Ave., NW
Washington, DC 20460-0001

Attention: **Matthew Khan – Clothianidin Chemical Review Manager**

Subject: **Comments on EPA Draft Biological Evaluations for Clothianidin, Imidacloprid and Thiamethoxam (EPA-HQ-OPP-2021–0575)**

Dear Mr. Kahn:

Valent U.S.A. LLC and BASF Corporation welcome the opportunity to comment on the Agency's Draft Biological Evaluations (BE) for Clothianidin, Imidacloprid and Thiamethoxam.

Our comments are focused primarily on Clothianidin seed treatments. We understand the draft BE is just the first step in the evaluation of potential effects on threatened or endangered species and that it's an initial screening assessment, based on conservative assumptions, with the purpose of eliminating species that have no expectation of exposure. Our comments submitted here describe our primary concerns related to the draft BE and we respectfully request that EPA consider integration of our comments into the final BE. Our comments are organized into the following categories:

- Introduction – Clothianidin seed treatment uses
- Quantitative assessment of seed treatments
- Usage information for seed treatments
- Birds and Mammals assessment
- Aquatic assessment
- Seed treatment stewardship and technology

If you have any questions related to the information provided herein, please don't hesitate to contact us using the contact information that you have on file.

Sincerely,

Sue-Chi Shen
Sr. Regulatory Project Manager
Valent U.S.A. LLC

Gregory C. Mattern

Gregory Mattern
Product Registration Manager
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BASF and Valent Comments on EPA's Draft Endangered Species Biological Evaluation for Clothianidin (Docket ID EPA-HQ-OPP-2021-0575)

Introduction - Clothianidin Seed Treatment Uses

BASF Corporation (BASF) and Valent U.S.A. LLC (Valent) appreciate the opportunity to comment on the Agency's draft Biological Evaluation (BE) for clothianidin. We understand that the draft BE is just the first step in the evaluation of potential effects on threatened or endangered species and that it is an initial screening assessment, based on conservative assumptions, with the purpose of eliminating species that have no expectation of exposure. We have reviewed the draft BE and have several comments regarding clothianidin seed treatment uses, as outlined in detail in this document.

Innovation and product stewardship are core values that drive what we do. We provide our customers with quality seed treatment products, including the support and resources they need to overcome agronomic challenges. We are fully committed to integrated pest management (IPM) practices, proper stewardship, and the sustainable use of our products. Seed treatments are an important cornerstone in sustainable agriculture and IPM programs. Clothianidin seed treatments are highly effective to manage early-season pests and provide growers an economic return on their investment. Allowing growers to plant earlier can both maximize yield as well as optimize planting rates to reduce cost and eliminating the dependence on higher rates of soil and foliar applied insecticides and fungicides.

We appreciate EPA's acknowledgement of the value of ongoing stewardship efforts. We continue to provide education and outreach to our customers to ensure the use of best management practice (BMPs) and promote IPM when using our products. We will also continue to actively participate with industry partners in neonicotinoid product stewardship for seed treatments and other uses in agricultural crops, landscape and ornamental plants, turfgrass and pest management. We look forward to continuing conversations between the industry and EPA on stewardship efforts to increase awareness of proper pesticide usage.

Although not explicitly stated in the BE, it is our understanding based on the most recent EPA ecological risk assessments for clothianidin (US EPA, 2017, US EPA 2020), that the primary taxa of concern for clothianidin seed treatment uses are: freshwater aquatic invertebrates, estuarine/marine aquatic invertebrates (for rice uses only), and birds and mammals through consumption of treated seeds, as well as any related obligate species that are in the geography where the product is used or (e.g., fish species that consume aquatic invertebrates).

Quantitative Assessment of Seed Treatments

In Appendix 4-5, EPA notes that aquatic Estimated Exposure Concentrations (EECs) for foliar and soil treatments are orders of magnitude greater than corresponding seed treatments. It is further noted that foliar or soil treatments can thus be considered protective of seed treatment uses. We believe that it is unrealistically conservative to present foliar or soil treatment EECs as surrogates for seed treatment in the BE. Instead, EECs based on seed treatment uses should be quantitatively assessed alongside the foliar and soil treatment uses, resulting in a more transparent risk picture across the clothianidin uses. BASF notes that EPA has already calculated EECs for seed treatments (as summarized in the zip file of Appendix 3-1), which could be brought forward into the BE for assessment.

Usage information – Seed Treatments

Clothianidin can be applied to agricultural crops by ground foliar spray, soil treatment (*e.g.*, drench), chemigation (*e.g.*, soil incorporation or foliar), and as a seed treatment. For agricultural uses, the maximum single application rates allowed for clothianidin are 0.1 or 0.2 lb a.i./A (pounds of active ingredient per acre), depending on the crop. For seed treatment use, the maximum application rate ranges from an equivalent of 0.10 lb a.i./A for corn to 0.144 lb a.i./A for sugar beet. Clothianidin is registered for seed treatment use on various crops, including broccoli, canola/rapeseed, carrot, cereal grains, cotton, leafy greens, leek, onion, potato, rice, sorghum, soybean, and sugar beet.

Regarding the potential for multiple applications of clothianidin in a growing season, except for soybeans, BASF product labels do not permit foliar applications of clothianidin or other neonicotinoid insecticides following the planting of treated seed. For soybeans, although an uncommon practice because of resistance management or the availability of less expensive alternatives, foliar application is permitted 45 days after the planting of clothianidin treated seed. The Valent product label permits soil and foliar uses for potato and leafy vegetables, with the maximum application per year of 0.2 lb.ai/A for all applications combined, and also permits the foliar use for cotton and soybean with the same restriction.

Percent crop treated – Seed Treatments

Introduction

The draft Biological Evaluation (BE) for clothianidin does not include a quantitative risk assessment for seed treatments, thereby precluding the need for seed treatment percent crop treated (PCT) data used at Step 2 for refinement of the risk assessment. As also noted in this document in the comments on the aquatic risk assessment for seed treatment uses, we strongly encourage the agency to conduct a full quantitative assessment for seed treatment uses for full transparency and greater accuracy of characterizing the potential risks to endangered species associated with each application method. Seed treatment has reduced potential for offsite chemical transport of active ingredient via runoff and sediment-bound erosion and this should be reflected in the risk assessment.

To conduct a quantitative risk assessment for seed treatment uses, best-available data should be utilized regarding seed treatment usage statistics, which inform the PCT refinements at Step 2 of the BE. Context Market Research (Context) is an authoritative source of seed treatment information that can be used to estimate seed treatment PCTs; therefore, BASF explored the utilization of Context data as best-available PCT data for quantitative risk assessment of seed treatment uses. As discussed in detail in the coming sections, BASF obtained clothianidin usage data for key crops from Context and calculated national seed treatment PCTs for key clothianidin seed treatment uses, including: cereal grains, corn, cotton, sorghum, soybeans, and sugar beets.

The seed treatment PCTs calculated for theses crops aligned with certain expectations given knowledge on the seed treatment market, lending confidence to the calculated seed treatment PCT estimates. The results indicate that the Context national-scale seed treatment PCT usage estimates can be used for refinement of seed treatment quantitative risk assessment, particularly for cereal grains but also for soybeans, cotton, sorghum, and sugar beets.

These national seed treatment PCTs (2017 through 2021) were compared to the usage data (2014 – 2018) presented in the SUUM memo (Appendix 1-4 of the BE) to investigate the appropriateness of using foliar usage information (and PCTs), as a surrogate, for a seed treatment risk assessment. This is important because foliar usage information is available at the state level and thus could directly be utilized within EPA's current methods. For foliar applications, state-level usage information from Kynetec is presented for the following clothianidin-treated crops that also have a seed treatment: cotton and soybeans. BASF calculated national foliar PCTs from these data (adjusting for crop acreage in each state) and compared them to the estimated national seed treatment PCTs based on the Context data. For these crops, the comparison demonstrated that clothianidin is used almost exclusively as a seed treatment rather than as a foliar application. This limited analysis indicates, at least for these crops, that foliar usage information should not be used in quantitative seed treatment risk assessment.

Therefore, as a best practice for quantitative risk assessment for seed treatment uses, we recommend the utilization of Context usage estimates to develop national seed treatment PCTs as a refined approach, rather than assuming 100% (due to lack of data as stated in the SUUM memo) or using foliar PCT data as a surrogate. The following sections provide details of the BASF analysis.

Estimation of seed treatment PCTs at national scale

EPA provides clothianidin usage estimates in the National and State Summary Use and Usage Matrix (SUUM) memo, for individual uses in Appendix 1-4 of the draft BE. For each listed seed treatment use, no usage estimates are available, and it is indicated in the footnote: 'site not surveyed at the national level'. BASF agrees that among the data sources used to build the SUUM memo (*e.g.*, Kynetec, California Pesticide Use Reporting [PUR] data, Kline), information on acreage receiving seed treatments is not available. However, it should be noted that seed treatment acreage estimates are available from Context (2021 US & Canada Seed Treatment Study, (Context Network)). Context tracks information from surveys of seed treating companies within the crop industry[1]. Because the estimates are based on data from seed treating facilities (and do not reflect where the seed is planted) the PCT estimates from Context are only valid on a national scale. For this reason, these seed treatment PCTs cannot be *directly* applied to EPA's current methodology for incorporation of PCT, which is done at the state level. However, given the wide-range of market share for seed treatments among the various crops and clear differences between seed treatment and foliar PCTs for clothianidin (discussed below), seed treatment PCT is an important consideration for seed treatment risk assessment. To investigate the utilization of the Context usage estimates for quantitative risk assessment of seed treatment uses, BASF utilized the Context data to calculated national seed treatment PCTs for key crops with clothianidin seed treatments.

Based on industry knowledge, it was anticipated that nearly all corn acres (*i.e.*, >95%, except organic corn) are planted with clothianidin seed treatments. In contrast, it was expected that the clothianidin seed treatment PCT for cereal grains would be less than 10% due to significant market pressure from generic products. To check these hypotheses as well as additional crops of interest, BASF obtained clothianidin seed treatment usage estimates from Context for corn, soybean, cotton, sorghum, and cereal grains from the 2017 through 2021 growing seasons (*i.e.*, a 5-year period consistent with the EPA approach to estimate usage). The result, for each crop, was an annual estimate of acres receiving seed treatments for each product containing clothianidin. To perform the PCT calculation, annual national acres planted estimates were obtained from USDA's National Agricultural Statistics Service (NASS) Quick Stats. The seed treatment planted acres were divided by the annual planted acres from NASS to obtain seed treatment PCTs. The resulting PCT estimates are provided in Table 1.

[1] While the Context data includes seed treatment facilities in both the United States and Canada, the query was structured to only include seed treatment facilities located in the United States, assuming seed purchased in Canada would not be planted in the U.S. and vice versa.

Table 1. Calculation of national clothianidin seed treatment PCT estimates for key uses

Crop / Year	Annual ST Acres (Context)[A]	Annual Planted Acres (NASS)	Annual PCT	5-Year Average PCT
Cereal grains: Barley				
2017	60,000	2,486,000	2.4	2.4
2018	60,000	2,548,000	2.4	
2019	70,000	2,772,000	2.5	
2020	70,000	2,726,000	2.6	
2021	61,899	2,660,000	2.3	
Cereal grains: Wheat				
2017	1,330,000	46,052,000	2.9	2.1
2018	1,320,000	47,815,000	2.8	
2019	680,000	45,485,000	1.5	
2020	660,000	44,450,000	1.5	
2021	934,860	46,703,000	2.0	
Corn [B]				
2017	74,200,000	90,167,000	82.3	91.5
2018	70,890,000	88,871,000	79.8	
2019	68,610,000	89,745,000	76.4	
2020	99,760,000	90,652,000	110.0	
2021	100,941,588	93,304,000	108.2	
Cotton				
2017	3,610,000	12,717,500	28.4	23.4
2018	4,130,000	14,100,300	29.3	
2019	3,810,000	13,735,700	27.7	
2020	1,790,000	12,092,000	14.8	
2021	1,582,065	11,190,500	14.1	
Sorghum				
2017	3,240,000	5,629,000	57.6	60.4
2018	3,810,000	5,690,000	67.0	
2019	3,330,000	5,265,000	63.2	
2020	3,540,000	5,880,000	60.2	
2021	4,088,700	7,340,000	55.7	
Soybean				
2017	18,960,000	90,162,000	21.0	21.4
2018	19,230,000	89,167,000	21.6	
2019	15,190,000	76,100,000	20.0	
2020	19,070,000	83,354,000	22.9	
2021	18,616,294	87,235,000	21.3	
Sugar beet				
2017	860,000	1,131,400	76.0	76.1
2018	860,000	1,113,100	77.3	
2019	860,000	1,133,000	75.9	
2020	870,000	1,162,200	74.9	
2021	887,216	1,160,600	76.4	

Abbreviations:
NASS = National Agricultural Statistics Service; PCT = percent crop treated; ST = seed treatment
Notes:
[A] Citation: 2021 US & Canada Seed Treatment Study, (Context Network)
[B] In the corn market, enough seed is treated every year to meet forecasted acreage assuming 10% seed discard. For example in 2021, ~106 million acres were treated assuming ~10.6 million Ac seed discard, resulting in ~95 million acres of remaining seed, which is very close to the 93 million planted acres from NASS.

For cereal grains, Context only tracks wheat and barley and not the other labeled crops (buckwheat, millet, oats, rye, teosinte, triticale). However, based on USDA-NASS acres planted estimates, these two crops represent ~90% of national cereal grain acreage using data for barley, millet, oats, rye and wheat (note: NASS does not track data for buckwheat, teosinate, and triticale). Therefore, PCT estimates based on these two crops should be representative of cereal grains. PCT estimates for barley and wheat were stable during the period of 2017 to 2021, with 5-year average PCTs ranging from 2.1 to 2.4%, indicating a significant potential area for refinement in a quantitative risk assessment of seed treatment uses. The high-level of agreement between the usage estimates from Context and low market share for clothianidin among cereal grain seed treatments lends confidence to the obtained PCT estimates for cereal grains and other crops.

For corn, as anticipated, the usage estimates demonstrate nearly all corn acreage is planted in clothianidin treated seed. Annual PCT estimates demonstrate a trend of increasing usage from 82.3% in 2017 to 108.2% in 2021 (5-year average PCT = 91.5%). A sharp increase in clothianidin seed treatment PCT occurred from the 2019 to 2020 growing seasons, reflecting product changes in the market. The phenomenon of PCT >100% (occurring for years 2020 and 2021) reflects common industry practice to treat 110% to 120% of the forecasted planted corn acreage for inventory management. The high-level of agreement between the usage estimates from Context and industry knowledge of what is done in practice lends confidence to the obtained PCT estimates for corn and other crops.

For cotton, the acreage receiving clothianidin seed treatments experienced a significant decline following the 2019 growing season, reacting to market pressure from generic alternatives. The PCT ranged from 29.3% in 2018 to 14.1% in 2021 with a 5-year average of 23.4%.

For sorghum, annual PCT estimates ranged from 55.7% in 2021 to 67.0% in 2018 with a 5-year average of 60.4%.

For soybean, annual PCT estimates were stable during the period of 2017 to 2021 (range: 21.0% to 22.9%), with a 5-year average PCT of 21.4%.

For sugar beet, annual PCT estimates were stable during the period of 2017 to 2021 (range: 74.9% to 77.3%), with a 5-year average PCT of 76.1%.

These PCT estimates demonstrate potential areas of refinement in a quantitative risk assessment for key seed treatment uses, particularly for cereal grains, cotton, and soybean with national seed treatment PCTs of ~2.4%, 23.4%. and 21.4%, respectively.

Comparison of seed treatment and foliar PCTs

To inform best practices for incorporating PCT into a quantitative risk assessment for seed treatment uses, estimated seed treatment PCTs at the national scale were compared to the range of state-specific PCT estimates for foliar uses available in the SUUM memo (Appendix 1-4), which presents Kynetec survey data on foliar clothianidin applications from 2014 through 2018 (*i.e.*, a 5-year period) when available. No usage data are available in the SUUM memo for cereal grains, corn, sorghum, and sugar beets. For cotton and soybeans, a scaled national foliar PCT was calculated by adjusting state-specific PCTs by the fractional acreage of the crop in that state and comparing these values to the national seed treatment PCTs to identify best practices for a quantitative risk assessment of seed treatment uses.

Cereal grains, corn, sorghum, sugar beet

No usage information is provided in the SUUM memo (Appendix 1-4) regarding foliar applications to cereal grains, corn, sorghum, or sugar beets. This lack of data for foliar applications typically indicates that clothianidin is not typically applied to these crops as a foliar application. Since foliar usage data are not available for these crops, a comparison cannot be made to seed treatment PCTs.

Soybean

In total, Table 2 of the SUUM memo (Appendix 1-4) provides Kynetec data from 28 surveyed states. Of these states:

- PCT estimates are provided for 3 states:
    - AL: 0 to <2.5 PCT (<1% 5-year average)

  - AR: 0 to 10 PCT (<2.5% 5-year average)
  - LA: 0 to 15 PCT (5% 5-year average)
- "NR" is reported for 25 states:
  - indicates "that there is a very low likelihood that the given pesticide is used on that crop"
  - Assume PCT = 0%

The state-specific soybean usage estimates from the SUUM memo (Table 2 of Appendix 1-4) are provided in Table 2, which also includes additional columns from BASF to calculate the scaled national foliar PCT of clothianidin for soybeans, which is useful for comparison to the national seed-treatment PCT calculated from the Context data.

Table 2. State-specific clothianidin foliar usage estimates on soybean and calculation of scaled national PCT (Adapted from Table 2 of Appendix 1-4 of the Clothianidin BE)

State	Avg. Annual Crop Acres Grown [A]	Avg Annual Total Lbs. AI Applied [A]	Min. Annual PCT (%) [A]	Max. Annual PCT (%) [A]	Avg. Annual PCT (%) [A]	Assigned Avg. Annual PCT (%) [B,C]	Acreage Adj. PCT [B,D]
AL	500,000	(S)	0	<2.5	<1	1	0.01
AR	3,400,000	(S)	0	10	<2.5	2.5	0.10
LA	1,400,000	(S)	0	15	5	5	0.08
"NR" States[E]	80,800,000	NR	NR	NR	NR	0	0.00
U.S.	**86,100,000**	**Ac**	**Scaled National PCT [F]:**				**0.19**
Non-"NR"	**6.16**	**% U.S. Ac**					
"NR"	**93.8**						

Abbreviations:
NR = surveyed by the indicated source in the years listed, but no usage reported
(S) = site not surveyed at the national level
Notes:
[A] Column as reported in Table 2 of Appendix 1-4
[B] Column added by BASF
[C] Used for calculation of the national scaled PCT; BASF assumed the upper bound of the 5-year annual average PCT.
[D] Calculated for each state by multiplying the assigned 5-year annual average PCT by the fraction of U.S. soybean acres reported for the state. The values themselves have no relevance for the PCT assessment other than to calculate the summed value for all states (see 'Scaled National PCT; Note F)
[E] Includes the following 25 states: DE, GA, IL, IN, IA, KS, KY, MD, MI, MN, MS, MO, NE, NY, NC, ND, OH, OK, PA, SC, SD, TN, TX, VA, WI
[F] Calculated by summing the acreage-adjusted PCT values for each state. Assuming no usage for "NR" states, this represents the national PCT for foliar applications, which can be compared to the national seed treatment PCT.

The survey data in the SUUM memo indicates 5-year average state-specific PCT values all ≤ 5%; however, soybean acreage in these states only represents 6.16% of national soybean acreage (based on the 'avg. annual crop acres grown' data in Table 2 of the SUUM memo). Thus, there is a very low likelihood that clothianidin will be applied as a foliar application to 93.8% of U.S. soybean acreage ("NR" states). Assuming a PCT of 0% for "NR" states and the maximum annual average PCT for the three states with reported usage, a scaled 5-year average national PCT of 0.19% is calculated for foliar applications of clothianidin to soybeans.

Comparison of this scaled national PCT estimate for foliar applications (0.19%) to the national estimated seed treatment PCT (21.4%) indicates that clothianidin is predominantly used as a seed treatment on soybeans rather than applied as a foliar application. Therefore, should a quantitative risk assessment be conducted for seed treatments, the use of an estimated seed treatment PCT, based on Context data, would produce a more accurate risk assessment than either assuming 100% PCT (typically done when there is a lack of data) or adopting the foliar PCT estimates as a surrogate.

Cotton

In total, Table 2 of the SUUM memo (Appendix 1-4) provides Kynetec data from 15 surveyed states. Of these states:

- PCT estimates are provided for 4 states:
  - CA: 20 to 40 PCT (30% 5-year average)
  - NC: <1 to 5 PCT (5% 5-year average)
  - TN: 0 to 15 PCT (5% 5-year average)
  - TX: 0 to <2.5 PCT (<1% 5-year average)
- "NR" is reported for 11 states
  - indicates "that there is a very low likelihood that the given pesticide is used on that crop"
  - Assume PCT = 0%

The state-specific cotton usage estimates from the SUUM memo (Table 2 of Appendix 1-4) are provided in Table 3, which also includes additional columns from BASF to calculate the scaled national foliar PCT of clothianidin for cotton, which is useful for comparison to the national seed-treatment PCT calculated from the Context data.

Table 3. State-specific clothianidin foliar usage estimates on cotton and calculation of scaled national PCT (Adapted from Table 2 of Appendix 1-4 of the Clothianidin BE)

State	Avg. Annual Crop Acres Grown [A]	Avg Annual Total Lbs. AI Applied [A]	Min. Annual PCT (%) [A]	Max. Annual PCT (%) [A]	Avg. Annual PCT (%) [A]	Assigned Avg. Annual PCT (%) [B,C]	Acreage Adj. PCT [B,D]
CA	200,000	6,000	20	40	30	30	0.55
NC	400,000	(S)	<1	5	5	5	0.18
TN	300,000	(S)	0	15	5	5	0.14
TX	6,100,000	(S)	0	<2.5	<1	1	0.56
"NR" States[E]	3,910,000	NR	NR	NR	NR	0	0
U.S.	**10,910,000**	**Ac**	**Scaled National PCT [F]:**				**1.43**
CA	**1.83**	**% U.S. Ac**					
NC, TN, TX	**62.3**						
Non-"NR"	**64.2**						
"NR"	**35.8**						

Abbreviations:
NR = surveyed by the indicated source in the years listed, but no usage reported
(S) = site not surveyed at the national level
Notes:
[A] Column as reported in Table 2 of Appendix 1-4
[B] Column added by BASF
[C] Used for calculation of the national scaled PCT; BASF assumed the upper bound of the 5-year annual average PCT.
[D] Calculated for each state by multiplying the assigned 5-year annual average PCT by the fraction of U.S. cotton acres reported for the state. The values themselves have no relevance for the PCT assessment other than to calculate the summed value for all states (see 'Scaled National PCT; Note F)
[E] Includes the following 11 states: AL, AZ, AR, FL, GA, KS, LA, MS, MO, OK, SC
[F] Calculated by summing the acreage-adjusted PCT values for each state. Assuming no usage for "NR" states, this represents the national PCT for foliar applications, which can be compared to the national seed treatment PCT.

The survey data in the SUUM memo indicates a significantly higher PCT for foliar applications of clothianidin in California (30% 5-year average) compared to the other three surveyed states (≤ 5% 5-year averages); however, California cotton represents only 1.83% of U.S. cotton acres. The three other states with reported clothianidin foliar usage (NC, TN, and TX) represent 62.3% of U.S. cotton acres (based on the 'avg. annual crop acres grown' data in Table 2 of the SUUM memo). Thus, the majority of cotton acreage has a low PCT and, additionally, there is a very low likelihood that clothianidin will be applied as a foliar application to 35.8% of U.S. cotton acreage (*i.e.*, "NR" states). Assuming 0 PCT for "NR" states and the annual average PCT for the four states with reported usage, a scaled 5-year average national PCT of 1.43% is calculated scaling the state-specific PCTs by the fraction of national cotton acres in each state.

Comparison of this scaled national PCT estimate for foliar applications (1.43%) to the national estimated seed treatment PCT for cotton (23.4%) indicates that clothianidin is predominantly used as a seed treatment for cotton rather than a foliar application. Therefore, should a quantitative risk assessment be conducted for seed treatments, the use of an estimated seed treatment PCT, based on Context data, would produce a more refined risk assessment than either assuming 100% PCT (typically done when there is a lack of data) or adopting the foliar PCT estimates as a surrogate.

Discussion

BASF performed analysis of Context Market Research estimates of clothianidin seed treatment acres to demonstrate:

- refinement potential of utilizing Context seed treatment PCT estimate (best available data) for quantitative risk assessment of seed treatment uses
- the differences between foliar and seed treatment PCT at a national scale and that foliar PCTs should not be used as a surrogate for seed treatment PCTs

The current clothianidin BE does not present any information on usage from seed treatments. To align with the practice of utilizing best-available data in the BE, BASF strongly encourages EPA to develop methods to incorporate national-scale seed treatment usage estimates from Context. In this document, BASF has demonstrated the refinement potential for key clothianidin seed treatment crops, including: cereal grains (PCT ~2.4%), soybean (21.4%), cotton (23.4%), sorghum (60.4%), and sugar beets (76.1%). Market estimates confirmed a clothianidin seed treatment PCT of 90-100% for corn, limiting refinement potential for this crop.

The national seed treatment PCTs calculated from the Context data were compared to the clothianidin usage data presented in the SUUM memo (Appendix 1-4 of the BE), which provides information from various data sources on usage with respect to both foliar and seed treatment applications. Importantly, the SUUM memo does not include any usage information for seed treatments (*i.e.*, Context data). As a result, for seed treatments, no quantitative data are presented due to the "site not being surveyed at the national level" by Kynetec. For foliar applications, usage information from Kynetec is presented for the following crops that also have a seed treatment product containing clothianidin: cotton and soybeans. Therefore, no comparison between seed treatment and foliar PCTs could be made for cereal grains, corn, sorghum, and sugar beets. For cotton and soybeans, scaled national foliar PCTs were calculated from the individual state-level PCTs (from Table 2 of the SUUM memo) considering the fraction of national crop acreage occurring in each state. These scaled national foliar PCTs were compared to the estimated national seed treatment PCTs based on the Context data. The comparison revealed that:

- for cotton and soybeans, a given acre typically receives a seed treatment or a foliar application, but not both; and (stemming from this)
- seed treatment and foliar PCTs are not correlated and thus should not be used as surrogate data for each other.

BASF recommends utilizing the Context data to calculate national seed treatment PCTs for clothianidin and whenever possible. Adopting this approach will necessarily require the current PCT methodology in Step 2 to be re-considered for seed treatments as, currently, state-level PCT estimates are required. Thus, we encourage the Agency to consider alternative methods to utilize the best-available national-scale usage estimates from Context for seed treatments. Adoption of methods that allow for use of national seed treatment PCTs would align with EPA's practice of utilizing best-available data for the conduct of the risk assessment. For example, unless there is specific information indicating a high-degree of regional variability in the adoption of seed treatments, the Agency could consider simplifying assumptions regarding the variability of PCT as the state level to allow for use of the national seed treatment PCTs in the risk assessment at the state level (*i.e.*, aligning with current USEPA methods for the Step 2 consideration of PCT). Another option to consider would be to investigate ways to obtain seed treatment PCTs at the state level. For example, BASF (and other interested registrants) and EPA could work with market intelligence companies (*e.g.*, Kynetec, Context) to explore possible methods for obtaining seed treatment usage estimates at the state-level.

Birds and Mammals Assessment

In the most recent ecological risk assessment for clothianidin, EPA identified seed eating birds and mammals as taxa of concern for seed treatment uses of clothianidin. In the BE, EPA simply identified granivorous (i.e., seed eating) birds and mammals whose habitats overlapped with the geography of where clothianidin-treated seeds could be planted (i.e., the Action Area). However, the EPA did not consider individual species biology and factors such as proportion of seeds in the animal's diet, the time of year that a given animal would eats seeds and whether a given species would actually forage in a newly planted agricultural field. Therefore, BASF commissioned Dr. Joseph Sullivan, a Certified Wildlife Biologist, to evaluate whether the bird and mammalian species designated as LAA by EPA would likely forage in a freshly planted agricultural field and consume a clothianidin treated seed.

Birds

Based on Dr. Sullivan's analysis, 26 granivorous bird species designated by EPA as LAA would likely have *de minimis* potential exposure to clothianidin treated seeds, while an additional 26 species are non-seed eaters. His analysis of each granivorous species, with associated references, follows:

Attwater's Prairie-chicken *(Tympanuchus cupido attwateri)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Cereal grains, corn, cotton, rice, sorghum, soybeans.
Range: This subspecies is restricted to two sites on the central Gulf coast of Texas (Johnson, *et al.*, 2020; USFWS, 2021a). The full range for greater prairie-chicken extends from south Texas, into Mexico, and north across the Midwest and Plains into Saskatchewan and Alberta (IUCN, 2021).
Habitat: Attwater's prairie-chicken occurs in sandy coastal plain and oak-savannah. Foraging habitat is on the ground and occasionally in trees in winter. During the breeding season, prairie-chickens avoid agriculture and areas with abundant trees (Johnson, *et al.*, 2020).
Diet: Adult Attwater's prairie-chickens typically eat native plants with cultivated grains contributing a smaller portion of the diet than for greater prairie-chickens. Juveniles and chicks primarily eat insects during the summer. Cultivated grains, likely mostly spilled grain from the previous growing season, contribute 9% of the diet in Texas in winter. During spring and summer, adults consume leaves, seeds, buds, fruits, and insects (Johnson, *et al.*, 2020).
Migration: Not migratory but move between wintering and breeding grounds (Johnson, *et al.*, 2020).
<u>Likelihood for Exposure to Treated Seeds</u>: **Low**. Although greater prairie-chickens consume notable quantities of spilled grain during the fall and winter, Attwater's prairie-chicken consumes smaller amounts of grain. All the focal crop seeds are within the size range that the Attwater's prairie-chicken is capable of consuming. However, during the planting season for crops, Attwater's prairie-chickens are focusing more on insects than plant food resources and tend to avoid agricultural areas for breeding.

Audubon's Crested Caracara *(Caracara cheriway audubonii)*

Conservation Status: Population in Florida—Threatened (USFWS, 2020a).
Focal Crop Overlap: Cereal grains, corn, cotton, rice, sorghum.
Range: The taxonomic designation for caracaras differs among experts, but for this account Audubon's crested caracara is restricted central Florida (Morrison and Dwyer, 2020; USFWS, 2021a). In addition to

Florida, the full range for crested caracara includes areas from south-central Texas and into Mexico, also into extreme southern Arizona, Central America, northern South America, and Cuba (IUCN, 2021).
Habitat: In Florida, Audubon's crested caracara nesting and foraging habitat includes grassy prairies and native pastures dotted with numerous shallow ponds and sloughs and single or small clumps of live oak (*Quercus virginiana*), cabbage palm (*Sabal palmetto*), and cypress (*Taxodium* spp.). Audubon's crested caracaras frequently make use of available pasturelands. During breeding seasons, non-breeding caracaras use citrus groves and row crops more frequently than outside the breeding season. They can be found in grasslands and pastures; along edges of ditches, shallow wetlands, and sloughs within pastures; around marshes, ponds, dwellings and farm buildings; in newly plowed or burned fields; on agricultural lands including sod and cane fields, citrus groves, and dairies. Scavenges along roads, at slaughterhouses, poultry houses, and urban dumps (Morrison and Dwyer, 2020).
Diet: Audubon's crested caracara forage on a wide variety of animal matter such as insects; small and occasionally large vertebrates, including fish, reptiles, amphibians, birds, and mammals; eggs; and carrion of all types. Pellets collected at nests in Florida regularly contain vegetative matter, mostly grasses, seeds, and leaves, but vegetation might be ingested inadvertently and not represent deliberate dietary selection (Morrison and Dwyer, 2020).
Migration: Not migratory. Breeding pairs defend breeding territory year-round (Morrison and Dwyer, 2020).
Likelihood for Exposure to Treated Seeds: **Low**. Audubon's crested caracara forage primarily and almost exclusively on animal matter. Ingestion of seeds might be unintentional. All the focal crop seeds are within the size range that the Audubon's crested caracara is capable of consuming. Although Audubon's crested caracara forage in and around row crops and other agriculture, no evidence supports intentional ingestion of grains or freshly planted treated seeds.

Bachman's Warbler *(Vermivora bachmanii)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Cereal grains, corn, cotton.
Range: In the Southeast U.S., this species breeds along the Atlantic coast in South Carolina and spends the nonbreeding season in southern Florida (USFWS, 2021a). The full breeding range for Bachman's warbler extend from coastal Virginia to coastal Georgia, west to eastern Texas, and north inland to southern Indiana and possibly Ohio. The species winters in Cuba as well as southern Florida (Hamel, 2020; IUCN, 2021).
Habitat: Bachman's warblers use portions of the bottomlands and headwater swamps that were inundated for relatively short periods compared to the lowest and wettest areas and historically, old-growth stands of bottomland forests. In some areas they might also use upland forests. During migration, they use floodplain forests. During the nonbreeding season, Bachman's warblers use dry, semideciduous forest, in forested wetlands, and forested urban open space. Foraging habitat is on in trees and shrubs, sometimes very close to the ground. Reports indicate they also forage in some members of the mustard family (Hamel, 2020).
Diet: Bachman's warblers primarily feed on insects and spiders, often caterpillars. The only seeds reported are for winter cress (*Barbarea* sp.) (Hamel, 2020).
Migration: Migrates in the winter primarily to Cuba, with scattered reports in southern Florida (Hamel, 2020).
Likelihood for Exposure to Treated Seeds: **None**. Bachman's warblers consume few seeds and forage off the ground almost entirely in trees and shrubs. Only crops with the smallest seeds are within the range Bachman's warbler is capable of consuming. There are no reports of Bachman's warblers foraging in an open habitat similar to a freshly planted row crop field.

Cape Sable Seaside Sparrow *(Ammospiza maritimus mirabilis)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Corn.
Range: This subspecies is restricted to the Everglades of southern Florida (USFWS, 2021a). The full breeding range for seaside sparrow extends from coastal New England to coastal New York, as well as those areas where it is resident along the Atlantic Coastline, and along the Gulf Coast. They occur along

the Atlantic Coast of Florida and possibly the southern Texas coast in the nonbreeding season only (Post and Greenlaw, 2020; IUCN, 2021).
Habitat: The Cape Sable seaside sparrow is resident year-round in freshwater habitats of the Everglades. This subspecies has recently nested in prairie habitats composed of clumped and unclumped smooth cordgrass (*Spartina bakeri)*, sparse sawgrass (*Cladium jamaicense*), and muhly grass (*Muhlenbergia capillaris*). The majority Cape Sable seaside sparrows now inhabits muhly grass prairie. Seaside sparrows otherwise occupy tidal marshes and nest above the mean high tide mark. Foraging habitat is primarily along the ground in the marsh mud. Less frequently they forage above the ground hopping or climbing through grass (Post and Greenlaw, 2020).
Diet: Cape Sable seaside sparrows primarily feed on adult and larval insects, spiders and spider egg cases, and amphipods during the breeding season. Seeds are more commonly eaten during the nonbreeding season, along with adult insects, spiders, decapods, amphipods, and mollusks (Post and Greenlaw, 2020).
Migration: Cape Sable seaside sparrows do not migrate, but the northeastern populations of the seaside sparrow migrate as far south as Florida (Post and Greenlaw, 2020).
Likelihood for Exposure to Treated Seeds: **None.** Cape Sable seaside sparrows consume seeds primarily during the fall and winter and forage in marsh habitats. Only crops with seeds the size of millet or smaller are in the size range the Cape Sable seaside sparrows is capable of consuming. There are no reports of Cape Sable seaside sparrows foraging in an open habitat similar to a freshly planted row crop field.

Eastern Black Rail *(Laterallus jamaicensis jamaicensis)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Canola/rape, cereal grains, corn, cotton, rice, sorghum, soybeans, and sugarbeets.
Range: This subspecies is shown to occur as far west as Colorado and New Mexico and as far north as Minnesota (USFWS, 2021a). However, Eddleman *et al.* (2020) indicate the eastern black rail breeds in eastern North America from the Great Lakes region east to New York and south to Belize and Guatemala and central Florida. The full breeding range for black rail extends to the San Francisco Bay area in isolated locations. The eastern black rail winters along the Gulf of Mexico and in the Greater Antilles (Eddleman *et al.*, 2020; IUCN, 2021).
Habitat: Black rails nest in high portions of salt marshes, shallow freshwater marshes, wet meadows, and flooded grassy vegetation. Most breeding areas are vegetated by fine-stemmed emergent plants, such as rushes, grasses, or sedges. Foraging habitat is on or near substrate at edges of stands of emergent vegetation. In tidal smooth cordgrass (*Spartina alterniflora*) marsh, they forage both above and below high-tide line (Eddleman *et al.*, 2020).
Diet: Black rails consume small aquatic and terrestrial invertebrates and seeds. Diets might consist primarily of animal matter, including snails, insects, and amphipods. Seeds in the diet consist of aquatic plants such as cattails and bulrush (Eddleman *et al.*, 2020).
Migration: Migration is not well-known, but populations of eastern black rails do not appear present during winter suggesting they migrate, although individuals are seen as far north as New Jersey in the winter. Eastern black rails arrive on the breeding grounds from mid-March through early May (Eddleman *et al.*, 2020)
Likelihood for Exposure to Treated Seeds: **None**. Eastern black rails consume seeds of emergent aquatic plants and forage in marsh habitats. Seeds consumed by black rails are small, suggesting only small seeds are in the size range the eastern black rails commonly consume. There are no reports of eastern black rails foraging in an open habitat similar to a freshly planted row crop field.

Eskimo Curlew *(Numenius borealis)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Cereal grains, corn, sorghum, soybeans.
Range: Eskimo curlews breed in the Arctic Northwest Territories (IUCN, 2021; Gill *et al.*, 2020) with potential breeding range in northern Alaska (Gill *et al.*, 2020). USFWS (2021) includes much of southern Alaska as potential breeding range. Areas in eastern Nebraska and coastal Texas are included as migratory stopovers. Eskimo curlews overwinter in areas of Argentina and Chile (IUCN, 2021).

Habitat: Breeding habitat is arctic and subarctic grassy meadows. During spring migration, Eskimo curlews have been observed foraging in cultivated fields, recently tilled fields, "old abandoned fields," and pasture-lands. During fall migration, South of Labrador (especially Massachusetts), they are reported more commonly on old fields, pastures, wet and dry salt grass meadows, sand dunes, and intertidal flats (Gill *et al.*, 2020).
Diet: Eskimo curlews eat seeds from grass during fall migration. During the spring migration, they consume insects such as grasshopper, along with insect eggs and larvae, and worms in freshly plowed fields (Gill *et al.*, 2020).
Migration: Spring migration consists of long-distance movements through Texas, Oklahoma, Nebraska, Kansas, and South Dakota. In Nebraska, they arrive in late April and depart by mid-May (Gill *et al.*, 2020).
Likelihood for Exposure to Treated Seeds: **Unlikely**. Although Eskimo curlews forage in freshly plowed and possibly other cultivated fields during spring migration, they focus on invertebrate prey items. All the focal crop seeds are within the size range that the Eskimo curlew is capable of consuming. Therefore, it is possible, but unlikely that they could inadvertently consume a treated seed from a recently planted row crop field.

Florida Grasshopper Sparrow *(Ammodramus savannarum floridanus)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Cereal grains, corn, cotton, rice, sorghum.
Range: This subspecies is restricted year-round to prairies north and west of Lake Okeechobee to central Osceola Co. in Florida (Vickery, 2020; USFWS, 2021a). The full range for grasshopper sparrows extends east of the Rocky Mountains and in portions of California, Idaho, and Washington during the breeding season and throughout the Southeast through Texas and into Mexico and Central America during the winter (IUCN, 2021).
Habitat: Florida grasshopper sparrows select native palmetto (*Serenoa repens*)-wiregrass (*Aristida stricta*) prairie throughout the year. There is no mention of using agricultural lands or row crops at any time of the year (Vickery, 2020).
Diet: Grasshopper sparrows generally focus on insects during the summer and grass and sedge seed during the winter. Grasshopper sparrows will consume seeds as large as sunflower seeds (Vickery, 2020).
Migration: Not migratory but might make small local seasonal movements (Vickery, 2020).
Likelihood for Exposure to Treated Seeds: **Low**. Florida grasshopper sparrows shift from a focus on seeds during the winter to insects in the summer. All the focal crop seeds, except possibly corn, are within the size range that the Florida grasshopper sparrow is capable of consuming. During the planting season for crops, grasshopper sparrows are focusing more on insects than plant food resources and are not reported to use row crops during the planting season.

Florida Scrub-jay *(Aphelocoma coerulescens)*

Conservation Status: Threatened (USFWS, 2020a).
Focal Crop Overlap: Canola/rape, cereal grains, corn, cotton, rice, sorghum, and soybeans.
Range: This species is restricted to much of the central portion of the Florida peninsula (Woolfenden and Fitzpatrick, 2020; IUCN, 2021; USFWS, 2021a). Florida scrub-jays are resident to this area.
Habitat: Florida srub-jays are extremely habitat-restricted, occurring only in scrub and scrubby flatwoods of Florida, a xeromorphic shrub community dominated by a layer of evergreen oaks (myrtle oak [*Quercus myrtifolia*] and/or Archbold oak [*Q. inopina*], sand live oak [*Q. geminata*], Chapman oak [*Q. chapmanii*], and runner oak [*Q. minima*]), rusty lyonia (*Lyonia ferruginea*), and Florida rosemary (*Ceratiola ericoides*). Ground cover is sparse, dominated by saw palmetto (*Serenoa repens*) and sand palmetto (*Sabal etonia*). Bare sand patches are essential for foraging and acorn-caching. Florida scrub-jays prefer driest microhabitats for foraging, favoring shrubby oaks and, secondarily, palmetto patches. Around human development they often forage on grassy road margins (Woolfenden and Fitzpatrick, 2020).
Diet: They primarily consume arthropods (especially grasshoppers, bush crickets, caterpillars, and spiders) and acorns. Captures small vertebrates opportunistically, especially treefrogs (mainly pine woods treefrog [*Hyla femoralis*]) and lizards (mainly green anole [*Anolis carolinensis*]) as well as small snakes. Other foods include berries (e.g., blueberries [*Vaccinium*], huckleberries [*Gaylussacia*], gallberry [*Ilex*

glabra], and greenbriars [*Smilax* spp.]) and seeds (e.g., pine, tread-softly [*Cnidoscolus*]), land snails, carrion, and other small vertebrates (Woolfenden and Fitzpatrick, 2020).
Migration: Florida scrub-jays do not migrate and are considered highly sedentary (Woolfenden and Fitzpatrick, 2020).
Likelihood for Exposure to Treated Seeds: **None.** Florida scrub-jays consume seeds of trees and forage primarily in scrub habitats and possibly along road margins. Seeds consumed by Florida scrub-jays are large (*e.g.*, acorns), so seeds such as corn could be within the size range consumed. There are no reports of Florida scrub-jays foraging in a habitat similar to a freshly planted row crop field.

Hawaiian (=Koloa) Duck *(Anas wyvilliana)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Corn, sorghum, soybeans.
Range: Hawaiian ducks occur on the main Hawaiian Islands of Niihau, Kauai, O'ahu, Molokai, Lanai, Maui, and Hawaii (IUCN, 2021; Engilis *et al.*, 2020; USFWS, 2021a). The current populations on the islands of Hawaii, O'ahu, and Maui have been reestablished through captive breeding with most populations now comprised of hybrids with introduced mallards (*Anas platyrhynchos*) (Engilis *et al.*, 2020).
Habitat: Hawaiian ducks are found along streams and wetlands including artificial wetlands (*e.g.*, aquaculture ponds and wetland agriculture, managed wetlands). Hawaiian ducks forage in agricultural wetlands for crops such as taro. They will also use stock ponds and reservoirs (Engilis *et al.*, 2020).
Diet: Hawaiian ducks consume aquatic invertebrates, aquatic plants, seeds, grains, and a few records of tadpoles. Documented seeds include rice and grass. However, rice is not grown in notable quantities in Hawaii (USDA, 2019a). The only occurrences of grains are when the grains were used as bait (Engilis *et al.*, 2020).
Migration: Not migratory but might make seasonal, altitudinal, and interisland movements (Engilis *et al.*, 2020).
Likelihood for Exposure to Treated Seeds: **Unlikely**. Hawaiian ducks forage in aquatic habitats that include agricultural wetlands and consume some seeds, but no use of row crops or consumption of seeds from row crops is reported. All the focal crop seeds are within the size range that the Hawaiian duck is capable of consuming. Although Hawaiian ducks have the potential to consume seeds from agricultural crops, there is no evidence that they currently do so.

Hawaiian Common Gallinule *(Gallinula galeata sandvicensis)*

Conservation Status: Endangered (USFWS, 2020a)
Focal Crop Overlap: Corn.
Range: This subspecies is a resident on the Hawaiian Islands on Kauai and Oahu (Bannor and Kiviat, 2020; USFWS, 2021a). The populations on the islands of Hawaii and Maui are possibly extinct (IUCN, 2021).
Habitat: Hawaiian common gallinules use natural ponds, marshes, streams, springs or seeps, lagoons, grazed wet meadows, taro and lotus paddies, shrimp-aquaculture ponds, reservoirs, sedimentation basins, sewage ponds, and drainage ditches. They require relatively dense vegetation along the margins of open water. They often nest along emergent vegetation edges of narrow interconnecting waterways with a high degree of interspersion of emergent vegetation patches with open water thought favorable. They forage at water surface and leaves of floating plants while swimming or walking on these plants; from beneath surface by dipping head, tipping-up, or occasionally diving in submerged vegetation; among emergent plants; and walking on floating mats or on shore. Hawaiian common gallinule may preferentially glean insects and mollusks from coontail, bacopa (*Bacopa* sp.), and bulrush. Common gallinules, possibly not the Hawaiian subspecies, are known to forage on lawns, fields, and golf courses adjoining water (Bannor and Kiviat, 2020).
Diet: Small, hard items are the most common food items. Sedge (Cyperaceae) seeds and snails are most important (Bannor and Kiviat, 2020). Food items consumed by this subspecies may include algae, aquatic insects, mollusks, other invertebrates, grass and guava seeds, and other plant material (USFWS, 2011a).
Migration: Hawaiian common gallinules are highly sedentary (Bannor and Kiviat, 2020).

Likelihood for Exposure to Treated Seeds: **None**. Hawaiian common gallinules mostly consume seeds of grasses and sedges in or adjacent to aquatic habitats. Seeds consumed by Hawaiian common gallinules are mostly small grass and sedge seeds, so only the small focal crop seeds could possibly be consumed. There are no reports of Hawaiian common gallinules foraging in a habitat similar to a freshly planted row crop field.

Hawaiian Coot *(Fulica americana alai)*

Conservation Status: Endangered (USFWS, 2020a)
Focal Crop Overlap: Corn, sorghum, and soybeans.
Range: This subspecies is a resident in small areas of most of the major Hawaiian Islands (Pratt and Brisbin, 2020; IUCN, 2021; USFWS, 2021a).
Habitat: Hawaiian coots breed on natural freshwater ponds, flooded taro fields, canefield reservoirs, concrete-lined sewage-treatment ponds, and brackish fishponds at low elevations. Wanderers may be found on stock tanks and mountain streams at higher elevations, nearly sterile artificial ponds on golf courses, and brackish to salt estuaries (Pratt and Brisbin, 2020). Hawaiian coots obtain food near the surface of the water, diving, or foraging in mud or sand. They also graze on upland grassy sites such as golf courses that are adjacent to wetlands, especially during times of drought and when food is unavailable elsewhere (USFWS, 2011a)
Diet: Diet of Hawaiian coots is not well-known, but they consume seeds, leaves, and stems of aquatic plants and lagoon mollusks (Pratt and Brisbin, 2020). Hawaiian coots are generalist feeders consuming seeds and leaves of aquatic plants, various invertebrates including snails, crustaceans, and aquatic or terrestrial insects, tadpoles, and small fish (USFWS, 2011). American coots might consume seeds of rice, oats, and wild and domestic grasses (Brisbin and Mowbray, 2020).
Migration: Hawaiian coots are nonmigratory, but make pronounced movements based on rainfall (Pratt and Brisbin, 2020).
Likelihood for Exposure to Treated Seeds: **None**. Hawaiian coots are known to consume seeds, but the specific type of seed is not described. American coots are known to consume rice and oats, but these crops are not grown in Hawaii. Seeds consumed by Hawaiian coots are not described, but the size range consumed by American coots suggest that corn, sorghum or soybeans might be larger than commonly consumed by Hawaiian coots. There are no reports of Hawaiian coots foraging in a habitat similar to a freshly planted row crop field.

Hawaiian Crow *(Corvus hawaiiensis)*

Conservation Status: Endangered (USFWS, 2020a) and extinct in the wild (Banko *et al.*, 2020a)
Focal Crop Overlap: Corn.
Range: This species historically occurred only on the big island of Hawaii (Banko *et al.*, 2020a; IUCN, 2021; USFWS, 2021a).
Habitat: Dry-forest nesting habitat of Hawaiian Crows is dominated by 'ōhi'a (*Metrosideros polymorpha*), lama (*Diospyros sandwicensis*), māmane (*Sophora chrysophylla*), and naio (*Myoporum sandwicense*). Upland nonbreeding habitat consists mainly of koa and 'ōhi'a, but other native trees include māmane, naio, and 'iliahi (*Santalum* spp.). Most upland forests have been substantially altered by logging and cattle-grazing. Hawaiian crows forage in trees (trunks, branches, foliage), shrubs, and thick vines ('ie'ie). Occasionally they feed on the ground, sometimes where vegetation is moderately dense (Banko *et al.*, 2020a).
Diet: They are omnivorous, taking fruits of many species of trees and shrubs, invertebrates, and small bird eggs and nestlings. Seeds of trees fruits such as hō'awa (Pittosporum spp.) are also consumed. Seeds of fruits are commonly found in fecal samples of prebreeding and breeding adults occupying wet forest (Banko *et al.*, 2020a).
Migration: Hawaiian crows are nonmigratory, but they might make elevational and habitat shifts seasonally (Banko *et al.*, 2020a).
Likelihood for Exposure to Treated Seeds: **None**. Hawaiian crows consume seeds of fruits and forage primarily in trees or on the ground where vegetation is dense. Seeds consumed by Hawaiian crows from fruits, so focal crop seeds would not likely be consumed. There are no reports of Hawaiian crows foraging in a habitat similar to a freshly planted row crop field.

Hawaiian Goose *(Branta sandvicensis)*

Conservation Status: Threatened (USFWS, 2020a).
Focal Crop Overlap: Corn, sorghum, soybeans.
Range: Hawaiian geese occur on the main Hawaiian Islands of Kauai, Maui, and Hawaii (IUCN, 2021; Banko *et al.*, 2020c; USFWS, 2021a). Since 1960, captive breeding and wild-release programs have reintroduced populations to the islands of Hawaii, Maui, and Kauai (Banko *et al.*, 2020c).
Habitat: Hawaiian geese nest in mid- and high-elevation habitats on Hawaii and Maui but nest at lower elevations in managed grass habitats on Kauai. During the nonbreeding season, Hawaiian geese in habitat mixed shrub and grassland habitats. Hawaiian geese do not necessarily avoid agricultural areas (Banko, *et al.*, 2020c).
Diet: Hawaiian geese consume leaves, seeds, fruits, and flowers of at least 50 species of native and alien plants, mainly grasses, herbs, and shrubs. Seeds are from grasses and sedges, both native and introduced. Berries are from shrubs. No mention of consumption of any crop seeds (Banko, *et al.*, 2020c).
Migration: Not migratory but might make seasonal and altitudinal movements (Banko, *et al.*, 2020c).
<u>Likelihood for Exposure to Treated Seeds</u>: **Unlikely**. Hawaiian geese forage in terrestrial habitats and sometimes along the edges of ponds. They commonly consume seeds, but no use of row crops or consumption of seeds from row crops is reported. All the focal crop seeds are within the size range that the Hawaiian goose is capable of consuming. Although Hawaiian geese have the potential to consume seeds from agricultural crops, there is no evidence that they currently do so.

Hawaiian Stilt *(Himantopus mexicanus knudseni)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Corn, sorghum, soybeans.
Range: Hawaiian stilts occur on all the main Hawaiian Islands (IUCN, 2021; Robinson *et al.*, 2020; USFWS, 2021a). The range of the full species includes breeding areas through large areas of the U.S. West and along the Atlantic coastline into Florida. Black-necked stilts are resident through much of Central and South America (Robinson *et al.*, 2020).
Habitat: Hawaiian stilts occur on islets, islands, at the edges of shallow ponds, and mud flats where water is fresh to saline and ancient fishponds constructed by Hawaiians. In most wetlands, the predominant vegetation is invasive and introduced, and must be controlled by active management. Characteristic associated wetland plants include nonnative pickleweed (*Batis maritima*) and nonnative California grass (*Brachiaria mutica*). Nesting almost exclusively on human-maintained wetlands because others are too overgrown. Also uses edges of taro ponds. While wading, tend to feed in shallow water at any depth up to the height of the breast. In Hawaii, stilts cluster to feed around delivery pipes carrying water runoff from sugar cane fields (Robinson *et al.*, 2020).
Diet: Hawaiian stilts mainly eat aquatic invertebrates and fish. Seventy percent of their foraging time is spent pursuing fish and tadpoles. A small proportion of their diet consists of seeds (Robinson *et al.*, 2020).
Migration: Not migratory but might make seasonal movements (Robinson *et al.*, 2020).
<u>Likelihood for Exposure to Treated Seeds</u>: **None**. Hawaiian stilts forage in aquatic habitats and sometimes along the edges of ponds. They infrequently consume seeds, and no use of row crops or consumption of seeds from row crops is reported. The types of seeds consumed is not reported. So, the extent to which focal crop seeds are within the size range that the Hawaiian silts consume is not known. Hawaiian stilts do not forage in habitats similar to freshly planted row crops.

Inyo California Towhee *(Pipilo crissalis eremophilus)*

Conservation Status: Threatened (USFWS, 2020a).
Focal Crop Overlap: Cereal grain, corn, cotton, sorghum.
Range: Inyo California towhees occur in the Argus Mountains in Inyo County in California (Benedict *et al.*, 2020; USFWS, 1998a; 2021a). The range of the California towhee includes areas in southern Oregon, northern California west of the Cascade Mountains, the Foothills of the Sierra Nevada Mountains, along coastal California inland to the Salton Sea, and south into Baja California in Mexico (IUCN, 2021; Benedict *et al.*, 2020).

Habitat: Inyo California towhees nest and forage in areas of dense riparian vegetation dominated by willows (*Salix* spp.), Fremont cottonwood (*Populus fremontii*), and desert olive (*Forestiera neoinexicana*). They also nest in shrubs of the upland community adjacent to riparian habitat and use the upland habitat as their principal foraging grounds. This habitat consists of Mojave creosote bush (*Larrea tridentata*) scrub or Mojave mixed woody scrub. Inyo California towhees forage in open rocky and sandy desert hillsides or low branches of large shrubs and in the leaf litter in dense riparian vegetation (USFWS, 1998a; Benedict *et al.*, 2020).
Diet: No diet information is available specifically for Inyo California towhees. However, California towhees have a diet of predominantly seeds along with some insects. Major food items are weed seeds. Grain constituted 28% of diet, largely oats, barley, and wheat; wild and cultivated fruit accounted for 4%. In oak-pine woodlands, the diet consisted of 21% seeds, 32% flowers, and 16% oak catkins, with oak catkins important early in spring (USFWS, 1998a; Benedict *et al.*, 2020).
Migration: Not migratory but might make seasonal movements (USFWS, 1998a; Benedict *et al.*, 2020).
Likelihood for Exposure to Treated Seeds: **None**. Inyo California towhees forage in shrubby riparian and desert hillside habitats. They frequently consume seeds. Although California towhees are reported to consume grain seeds, no use of row crops or consumption of seeds from row crops is reported for Inyo California towhees. The types of seeds consumed include seeds as large as grain seeds. Inyo California towhees do not forage in habitats similar to freshly planted row crops.

Masked Bobwhite *(Colinus virginianus ridgwayi)*

Conservation Status: Endangered (USFWS, 2020a). Masked bobwhite in the wild in Arizona and Sonoro Mexico are essentially nonexistent (USFWS, 2019).
Focal Crop Overlap: Cereal grains, corn, cotton, sorghum.
Range: This subspecies has been reintroduced to SE Arizona and occurs naturally in northcentral Sonora in Mexico (Brennan *et al.*, 2020; USFWS, 2021a). The full range for northern bobwhite extends from southern New England, across the eastern U.S. to as far north as Wisconsin and South Dakota, south to Texas through Florida. Northern bobwhites also occur in Cuba and throughout much of Mexico (IUCN, 2021). Excessive grazing in Arizona was the primary cause of extirpation from this region.
Habitat: Masked bobwhite occur in open savanna grassland within dry tropic scrub. They are associated with weedy bottom lands, grassy and herb-strewn valleys, and forb-rich plains (USFWS, 1995a). They select areas with higher brush cover than present overall with cover of 10 – 45% in Sonora and 20 – 100% in Arizona (USFWS, 2014a)
Diet: Diet of masked bobwhite is not well known. Chicks consume grasshoppers. Seeds of leguminous shrubs are important for adults (USFWS, 2014a).
Migration: Not migratory but might make small local seasonal movements (USFWS, 1995a).
Likelihood for Exposure to Treated Seeds: **Low**. The limited life history information for masked bobwhite makes determining the potential for consumption of treated seeds difficult. All the focal crop seeds are within the size range that the masked bobwhite is capable of consuming. However, masked bobwhite habitat consists of relatively dense woody cover, so it seems unlikely that masked bobwhite would venture into a freshly planted agricultural field.

Molokai Thrush *(Myadestes lanaiensis rutha)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Corn, sorghum, soybeans.
Range: Molokai thrushes occur only on the Hawaiian Island of Molokai and historically Maui (IUCN, 2021; Wakalee and Fancy, 2020; USFWS, 2021a).
Habitat: Molokai thrushes historically occupied closed mesic and wet ʻōhiʻa forests of broad elevational range and in remnant forest as well as in denser pristine forests. More recently the Molokai thrush has been found only in less affected habitat above 1,000 m having a closed canopy of ʻōhiʻa trees, supporting a large number of epiphytes, and an understory of ʻōlapa, pilo, pūkiawe, and tree ferns. They forage in shrubs, trees and vines and epiphytes (Wakalee and Fancy, 2020).
Diet: Molokai thrushes have a mixed diet of fruit, invertebrates, and flower parts. Seeds consumed are fruit seeds. No evidence that individual seeds are consumed (Wakalee and Fancy, 2020).

Migration: Not migratory but might make movements to follow food resources (Wakalee and Fancy, 2020).
Likelihood for Exposure to Treated Seeds: **None**. Molokai thrushes forage in forested habitats and collect food from above ground level. The only seeds consumed are associated with ingested fruits. The types of seeds consumed are solely fruit seeds. So, the extent to which focal crop seeds are within the size range that Molokai thrushes consume is not known. Molokai thrushes do not forage in habitats similar to freshly planted row crops.

Palila *(Loxioides bailleui)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Corn.
Range: Palila occur only on the Island of Hawaii (Banko *et al.*, 2020b; IUCN, 2021; USFWS, 2021a).
Habitat: Palila breeding and nonbreeding ranges consists of dry to mesic subalpine forest between 2,000 m and 3,000 m elevation containing significant densities of māmane on Mauna Kea. In areas where feral sheep and other ungulates have altered the habitat at higher elevations, naio (*Myoporum sandwicense*) is more common. They forage primarily in the canopy of trees, and rarely in shrubs or grasses (Banko *et al.*, 2020b).
Diet: The diet of palila consists mostly of immature seeds, flower parts and nectar, undeveloped pods, leaf buds, young leaves of māmane trees. Fruits, seeds, and leaves are also taken from other plants. Insects such as caterpillars are collected from trees (Banko *et al.*, 2020b).
Migration: Not migratory but might make movements to follow food resources (Banko *et al.*, 2020b).
Likelihood for Exposure to Treated Seeds: **None**. Palila forage in forested habitats and collect food from above ground level. The types of seeds consumed are tree seeds. Māmane seeds are roughly the size of corn kernals, so seeds as large as corn could be consumed. However, palilas do not forage in habitats similar to freshly planted row crops.

Puerto Rican Parrot *(Amazona vittata)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Corn and soybeans.
Range: Puerto Rican parrots occur in eastern Puerto Rico as well as north-central Puerto Rico (IUCN, 2021; Collar *et al.*, 2020; USFWS, 2021a).
Habitat: They are now confined to forests, at 650–2000 m, consisting of tabonuco (*Dacryodes excelsa)* forest, once important for feeding and breeding but much logged, palo colorado (*Cyrilla racemiflora)* zone, important for nesting, sierra palm (*Prestoea montana)* forest, to whose fruiting breeding is timed to coincide, and dwarf forest, used occasionally for food (Collar *et al.*, 2020).
Diet: The diet consists mostly of fruits, but also seeds, leaves, flower and bark of mostly trees along with shrubs and vines. Historically, they were considered pests in corn (Collar *et al.*, 2020).
Migration: Puerto Rican parrots are largely sedentary (Collar *et al.*, 2020).
Likelihood for Exposure to Treated Seeds: **Unlikely.** They are currently restricted to forest habitats. They most commonly forage on tree fruit, seeds, leaves flowers and bark, along with those of shrubs and vines. Although they have been historically considered a pest in corn, that is likely of the standing crop, not of seeds on the ground. They are unlikely to encounter freshly planted treated row-crop seeds.

Red Knot *(Calidris canutus rufa)*

Conservation Status: Threatened (USFWS, 2020a).
Focal Crop Overlap: Canola/rape, cereal grains, corn, cotton, rice, sorghum, soybeans, surgarbeets.
Range: This subspecies breeds in the low latitudes of Arctic Canada and winters from the Gulf of Mexico south to eastern South America (Baker, *et al.*, 2020; USFWS, 2021a). The full breeding range for all subspecies of red knots extends across the Arctic with winter ranges occurring in many warmer coastal regions throughout the world (Baker, *et al.*, 2020; IUCN, 2021). Although range maps do not depict migration routes, USFWS (2021a) depict many interior regions where red knots might stop during

migration. Baker, *et al.* (2020) indicate that a small number of red knots migrate through the interior of the U.S. and Canada with records occurring in Kansas at the Cheyenne Bottoms Wildlife Management Area.
Habitat: Red knots nest in the Arctic in sparse vegetation, frequently away from the coast. During non-breeding season, red knots are found in coastal sandy beaches, sandflats, and mudflats. During migration, most use marine habitats such as sandy coastal habitats or tidal inlets. During the northbound migration, some red knots use saline lakeshores in the Prairie Provinces of Canada as well as around Lake Ontario. During non-breeding times of the year, red knots focus on aquatic habitats where aquatic invertebrates are available (Baker, *et al.*, 2020).
Diet: During the breeding season, red knots consume aquatic invertebrates from muddy channels and streams, small marshes, shallow lakes, and brackish lagoons. During migration, red knots feed on aquatic invertebrates from tidal creeks and sandy beaches or sandbars and saltmarshes. The only time when red knots consume vegetation, including seeds, is on the breeding grounds when they arrive before aquatic invertebrates are available (Baker, *et al.*, 2020).
Migration: Red knots make long "jump" migration flights of up to 5,000 miles (8,000 kilometers). Red knots congregate during their northward migration along the Mid-Atlantic coast from April into June. Those red knots that migrate through the interior of North America have been observed in Kansas from mid-April through early June on the northbound migration and early August to late September on the southbound migration (Baker, *et al.*, 2020). Red knots could occur in areas during the planting season, but their aquatic habitats preclude occurrence in fields at planting.
Likelihood for Exposure to Treated Seeds: **None**. Throughout its range, red knots focus almost entirely on aquatic invertebrates. Only on their breeding grounds in the Arctic, might they consume vegetation. There is no indication that red knots feed in agricultural areas at any time of the year. They exhibit no potential to consume treated seeds at planting time in agricultural fields.

Red-cockaded Woodpecker *(Leuconotopicus borealis)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Canola/rape, cereal grains, corn, cotton, rice, sorghum, soybeans.
Range: This species occurs from eastern Virginia south through Florida, and west to eastern Texas and southern Missouri (IUCN, 2021; Jackson, 2020b; USFWS, 2021a).
Habitat: Red-cockaded woodpeckers do not migrate and spend all year in mature, almost pure pine forests consisting of longleaf (*Pinus palustris*), loblolly (*P. taeda*), slash (*P. elliottii*), shortleaf (*P. echinata*), Virginia (*P. virginiana*), pond (*P. serotina*) and pitch (*P. rigida*) pines (Jackson, 2020b). Red-cockaded woodpeckers primarily forage on pine trees but will forage in corn fields on corn earworms (*Heliothis zea*).
Diet: Red-cockaded woodpeckers primarily eat adult and larval arthropods and eggs of arthropods that inhabit the tree surface and subsurface (Jackson, 2020b). To a much lesser extent, they consume various seeds and fruits. Vegetable material includes seeds of pine (*Pinus* spp.) and fruits of wild cherry (*Prunus serotina*), pokeberry (*Phytolacca americana*), grape (*Vitis* spp.), magnolia (*Magnolia grandiflora*), poison ivy (*Rhus toxicodendron*), blueberry (*Vaccinium* spp.), and blackgum (*Nyssa sylvatica*). No mention of red-cockaded woodpeckers foraging on any seeds off the ground.
Migration: Not migratory.
Likelihood for Exposure to Treated Seeds: **None**. Although red-cockaded woodpeckers forage in corn fields, they do not consume the corn seeds. The time of year when foraging occurs in corn fields is after corn has matured and treated corn seeds would no longer be present. No evidence exists of this species consuming other seeds off the ground.

San Clemente Sage Sparrow *(Amphispiza belli clementeae)*

Conservation Status: Threatened (USFWS, 2020a).
Focal Crop Overlap: Cereal grains, sorghum (no crops on San Clemente Island).
Range: This subspecies occurs only on San Clemente Island off the coast of southern California (IUCN, 2021; Martin and Carlson, 2020; USFWS, 2021a). USFWS (2021a) depicts the range as including an area on the mainland because the county where the species is found is shown. The full range for the entire species extends much of the length of California and down into Baja California in Mexico (IUCN, 2021; Martin and Carlson, 2020).

Habitat: San Clemente sage sparrows are residents in the maritime desert scrub on San Clemente Island. They feed on the ground, often under shrubs and also on lower branches of shrubs (Martin and Carlson, 2020).
Diet: Diet consists of a lot of seeds, mostly grass and weeds seeds They consume insects during the breeding season (Martin and Carlson, 2020).
Migration: Not migratory.
<u>Likelihood for Exposure to Treated Seeds</u>: **None**. Although San Clemente sage sparrows frequently consume seeds, their restricted range, existing solely on San Clemente Island, precludes any opportunity to encounter treated row-crop seeds.

Western Snowy Plover *(Charadrius nivosus nivosus)*

Conservation Status: Threatened (USFWS, 2020a).
Focal Crop Overlap: Canola/rape, cereal grains, corn.
Range: This subspecies breeds spottily along Pacific Coast from southwestern Washington south to Baja California Sur, across Great Basin from southwest Montana south to e. California and central Colorado. They also occur in parts of the desert Southwest, and in the Great Plains from southern Saskatchewan south to northwest Texas (Page *et al.*, 2020; IUCN, 2021; USFWS, 2021a). The USFWS (2021a) shows the range of the western snowy plover being along the Pacific Coast along with some inland locations in California.
Habitat: On Pacific Coast, western snowy plovers nests on barren to sparsely vegetated sand beaches, dry salt flats in lagoons, dredge spoils deposited on beach or dune habitat, levees and flats at salt-evaporation ponds, and sand and cobble river bars up to 7 miles from the beach. At inland locations, western snowy plovers breeds up to 3,048 m on barren to sparsely vegetated ground at alkaline or saline lakes, reservoirs, ponds, and riverine sand bars and at sewage (occasionally), salt-evaporation, and agricultural wastewater ponds. They overwinter along the coast and at saline lakes inland. They forage on beaches, tide flats, river mouths, lagoon margins, salt flats, and salt ponds. At inland sites, they forage on shores of lakes, reservoirs, ponds, braided river channels, and playas (mostly at seeps and along streams). Although at inland habitats most feeding is in shallow (1–2 cm deep) water or on wet mud or sand, on playas some foraging also occurs on dry flats (Page *et al.*, 2020).
Diet: The diet of snowy plovers consists mostly of terrestrial, freshwater, brackish, and marine invertebrates. Few seeds are eaten, and the type of seeds is not indicated (Page *et al.*, 2020).
Migration: Coastal breeding populations of mostly resident, but inland populations are migratory. They overwinter in coastal areas (Page *et al.*, 2020).
<u>Likelihood for Exposure to Treated Seeds</u>: **None**. Western snowy plovers forage in coastal beach habitats and inland freshwater or saline lake habitats. The types of seeds consumed are not listed, so the range of focal crop seeds within the size range consumed by western snowy plovers is not known. However, western snowy plovers do not forage in habitats similar to freshly planted row crops.

Yellow-billed Cuckoo *(Coccyzus americanus)*

Conservation Status: Western populations are Threatened (USFWS, 2020a).
Focal Crop Overlap: Canola/rape, cereal grains, corn, cotton, rice, sorghum, soybeans, sugarbeets.
Range: The western yellow-billed cuckoo populations occur in scattered locations from eastern Montana south to New Mexico and west to the Pacific Coastal region (IUCN, 2021; Hughes, 2020; USFWS, 2021a). The full range for yellow-billed cuckoos covers the remaining areas of the U.S. from Wyoming south to Texas and eastward to the Atlantic Coast (IUCN, 2021).
Habitat: Western yellow-billed cuckoos prefer wooded riparian areas and also possibly in orchards adjacent to river bottoms. They forage in open areas, woodlands, orchards, and adjacent streams. Most foraging occurs above approximately 10 feet (9 meters), however, they also will gather insects or frogs or lizards off the ground (Hughes, 2020).
Diet: The diet consists mostly of large insects, particularly caterpillars. Yellow-billed cuckoos will consume fruit and seeds during the summer, but mostly during the winter. Plant material contributes roughly one percent of the overall diet (Hughes, 2020).

Migration: Western yellow-billed cuckoos are a late season migrant, arriving in New Mexico in late June (Hughes, 2020). The late season migration makes it unlikely western yellow-bill cuckoos will occur in areas during planting season.
Likelihood for Exposure to Treated Seeds: **None**. Since western yellow-billed cuckoos breed in riparian areas, forage from the ground infrequently, rarely consume seeds, and are unlikely to occur in areas where crops are grown during planting season, no exposure to treated seeds is expected.

Yellow-shouldered Blackbird *(Agelaius xanthomus)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Corn and soybeans.
Range: Yellow-shouldered blackbird populations occur in southwestern Puerto Rico, eastern Puerto Rico and on Mona Island (IUCN, 2021; Post, 2020; USFWS, 2021a).
Habitat: Nesting habitats range from open areas in the mangrove zone, red mangrove cays (small islands just off-shore), black mangrove swamp forests, savanna-like lowland pastures nesting in trees, suburban and urban areas, dry upland forest, mesquite woodland, coconut palms, and coastal cliffs. During the nonbreeding season, they are found in many habitat types, including cultivated fields They forage mostly in trees and the subcanopy. They forage on the ground infrequently during the breeding season, but more frequently in the ground in the nonbreeding season (Post, 2020).
Diet: The diet consists of arthropods such as insects, spiders or crustacea, fruits, nectar, and seeds such as sorghum, millet, corn, or sunflower. Food delivered to young is mostly insects with some arachnids. Seeds are not a major food item (Post, 2020).
Migration: Yellow-shouldered blackbirds do not appear to migrate (Post, 2020).
Likelihood for Exposure to Treated Seeds: Unlikely. Since yellow-shouldered blackbirds forage mostly in trees and the subcanopy during the breeding season at the time when row-crop fields might be planted, they are unlikely to forage in freshly planted row-crop fields. During the breeding season, seeds are eatened less frequently than arthropods. Seeds are more common in the diet during the nonbreeding season when treated seeds would be less available.

Yuma Ridgway's (Clapper) Rail *(Rallus obsoletus [=longirostris] yumanensis)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Cereal grains, corn, cotton, sorghum, soybeans, and sugarbeets.
Range: This subspecies is resident in freshwater, brackish, and salt marshes, both inland and coastal, from southeastern California and southwestern Arizona (Salton Sea and lower Colorado River valley) south through northeastern Baja California and northwestern Sonora to the Colorado River delta (Eddleman and Conway, 2020; IUCN, 2021; USFWS, 2021a).
Habitat: Yuma Ridgway's rails are found in variety of marsh types dominated by emergent plants, including southern cattail (*Typha domingensis*), California bulrush (*Schoenoplectus californicus*), chairmaker's bulrush (*Schoenoplectus americanus*), and sedges (Cyperaceae). Presence of emergent cover, not plant species or marsh area, is important trait of habitat. Arizona habitat includes sites with high coverage by water, low stem density, and moderate water depth used for foraging during nesting season; sites with shallower water near shorelines are used for nesting. Ideal habitat has mosaic of emergent plant stands of different ages interspersed with shallow pools of open water. In Arizona, Yuma Ridgway's rails forage at sites with high mean coverage by water, low stem density relative to other sites in marsh, and moderate water depth (Eddleman and Conway, 2020).
Diet: The diet of Yuma Ridgway's rails consists of aquatic invertebrates such as crayfish, and insects such as weevils and beetles. Some fish as eaten, as well as insect eggs. Few seeds are eaten, and the type of seeds is not indicated (Eddleman and Conway, 2020).
Migration: Yuma Ridgway's rails are not migratory (Eddleman and Conway, 2020).
Likelihood for Exposure to Treated Seeds: **None**. Yuma Ridgway's rails forage in inland freshwater or saline marsh habitats. The types of seeds consumed are not listed, so the range of focal crop seeds within the size range consumed by Yuma Ridgway's rails is not known. However, Yuma Ridgway's rails do not forage in habitats similar to freshly planted row crops.

Other bird species

There were numerous other species listed in the BE as LAA that are not known to consume seeds of any kind. These species include (with references):

- **`I'iwi (*Drepanis coccinea*)** - Fancy and Ralph, 2020
- **`O`u (honeycreeper) (*Psittirostra psittacea*)-** Snetsinger *et al.*, 2020b
- **Akekee (*Loxops caeruleirostris*)** - Lepson and Pratt, 2020
- **Akiapolaau (*Hemignathus wilsoni*)** - Pratt *et al.*, 2020a
- **Akikiki (*Oreomystis bairdi*)** - Foster *et al.*, 2020
- **California clapper rail (*Rallus longirostris obsoletus*)** – Eddleman and Conway, 2020
- **Crested honeycreeper (*Palmeria dolei*)** - Berlin and Vangelder, 2020
- **Coastal California gnatcatcher (*Polioptila californica californica*)** - Atwood and Bontrager, 2020
- **Everglade snail kite (*Rostrhamus sociabilis plumbeus*)** - Reichert *et al.*, 2020
- **Golden-cheeked warbler (=wood) (*Dendroica chrysoparia*)** - Ladd and Gass, 2020
- **Hawaii akepa (*Loxops coccineus*)** - Lepson and Freed, 2020a
- **Hawaii creeper (*Oreomystis mana*)** - Lepson and Woodworth, 2020
- **Kauai nukupuu (*Hemignathus Hanapepe*)** - Pratt *et al.*, 2020b
- **Least Bell's vireo (*Vireo bellii pusillus*)** – Kus *et al.*, 2020.
- **Light-footed clapper rail (*Rallus longirostris levipes*)** – Eddleman and Conway, 2020
- **Maui akepa (*Loxops ochraceus*)** - Lepson and Freed, 2020b
- **Maui nukupuu (*Hemignathus affinis*)**- Pratt *et al.*, 2020c
- **Maui parrotbill (honeycreeper) (*Pseudonestor xanthophrys*)** - Simon *et al.*, 2020
- **Mexican spotted owl (*Strix occidentalis lucida*)** - Gutiérrez *et al.*, 2020
- **northern aplomado falcon (*Falco femoralis septentrionalis*)** - Keddy-Hector *et al.*, 2020
- **Northern spotted owl (*Strix occidentalis caurina*)** - Gutiérrez *et al.*, 2020
- **Oahu creeper (*Paroreomyza maculate*)** - Baker and Baker, 2020b
- **Oahu elepaio (*Chasiempis ibidis*)** - VanderWerf, 2020
- **San Clemente loggerhead strike (*Lanius ludovicianus mearnsi*)** – Yosef, 2020
- **Small Kauai (=puaiohi) Thrush (*Myadestes palmeri*)** - Snetsinger *et al.*, 2020a
- **Southwestern willow flycatcher (*Empidonax traillii extimus*)** - Sedgwick, 2020

We assume that these determinations were therefore related to non-seed treatment uses of clothianidin.

Mammals

Based on Dr. Sullivan's analysis, 22 granivorous mammalian species designated by EPA as LLA would likely have *de minimis* potential exposure to clothianidin treated seeds, while an additional 15 species are non-seed eaters. There are 3 additional species that are restricted to counties where the focal crops are not grown. In addition, two of the species identified by EPA as LLA, the gray wolf and the Mexican wolf, have been officially delisted by US Fish and Wildlife Service (USFWS, 2020a). Dr. Sullivan's analysis of each granivorous species, with associated references, follows:

Alabama Beach Mouse *(Peromyscus polionotus ammobates),* Anastasia Island Beach Mouse *(P. p. phasma),* Choctawhatchee Beach Mouse *(P. p. allophrys),* Perdido Beach Mouse *(P. p. trissyllepsis),* Southeastern Beach Mouse *(P. p. niveiventris), and* St. Andrew Beach Mouse *(P. p. peninsularis)*

Conservation Status: All Classified as Endangered (USFWS, 2020a).
Focal Crop Overlap: Corn, cotton, rice, and sorghum.
Range: These six subspecies of the old field mouse occur in coastal Florida and Alabama. The Alabama, Anastasia Island, Choctawhatchee, Perdido, and St. Andew beach mice are all restricted to islands and coastal dunes. Only the southeastern beach mouse occurs any distance (up to 1 km) inland (USFWS,

1987; 1993a; 2010a; 2021a). The full range for oldfield mice extends throughout most of South Carolina, Georgia, Alabama, the panhandle of Florida and much of peninsular Florida (IUCN, 2021).
Habitat: The Alabama, Anastasia Island, Choctawhatchee, Perdido, and St. Andew beach mice inhabit coastal dunes, including the frontal dunes and adjacent inland scrub dunes. The southeastern beach mouse also occurs in coastal dunes, but it can occur inland in beach tree (*Croton punctata*), prickly pear cactus (*Opuntia humifusa*), saw palmetto (*Serenoa repens*), wax myrtle (*Myrica cerifera*), and sea grape (*Coccoloba uvifera*) (USFWS, 1987; 1993a; 2010a).
Diet: Beach mice eat seeds and small invertebrates. The seeds eaten are from sea oats (*Uniola paniculate*), dune panic grass (*Panicum amarum* and *P. repens*), railroad vine (*Ipomoea pes-caprae*), prickly pear cactus, and bluestem (*Schizachyrium scoparium*). They also eat fruits of dune spurge (*Chamaesyce bombensis*), ground cherry (*Physalis angustifolia*), and evening primrose (*Oenothera humifusa*) are utilized in autumn, while sea rocket (*Cakile lanceolata*), dune toadflax (*Linaria floridana*), and evening primrose make up the spring diet (USFWS, 1987; 1993a; 2010a).
Migration: None of the beach mice migrate or make seasonal movements (USFWS, 1987; 1993a; 2010a).
Likelihood for Exposure to Treated Seeds: **None**. The beach mice all consume seeds, but the seeds are of beach-growing grasses and other plants. They live only in coastal dunes and adjacent scrub habitats. They do not live or forage in habitats similar to freshly planted row-crop fields.

Amargosa Vole *(Microtus californicus scirpensis)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Cereal grains and corn.
Range: This subspecies occurs in the Tecopa Lake Basin and Amargosa Canyon (USFWS, 1997a; 2021a). The full range of the California vole extends north into Oregon, throughout most of California, and south into Baja California in Mexico (IUCN, 2021).
Habitat: The Amargosa vole occurs in isolated wetland habitats where bulrush is a dominant overstory perennial plant and the wetlands are not subject to regular inundation during heavy summer thunderstorms (USFWS, 1997a).
Diet: The diet of the Amargosa vole is assumed to be similar to the California vole which consumes primarily grasses and forbs, as well as seeds. When available, green emergent vegetation comprises most of the diet, with seeds becoming important in the summer and autumn (USFWS, 1997a).
Migration: Amargosa voles do not migrate or make seasonal shifts in habitat use (USFWS, 1997a).
Likelihood for Exposure to Treated Seeds: **None**. Amargosa voles occur only in wetlands in an isolated valley and canyon. Although they consume seeds, they would not venture into habitats similar to freshly planted row-crop fields. Therefore, there is no potential for Amargosa voles to consume pesticide-treated crop seeds.

Carolina Northern Flying Squirrel *(Glaucomys sabrinus coloratus)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Canola/rape, cereal grains, corn, sorghum, and soybeans.
Range: This subspecies occurs in the area along the border between North Carolina and Tennessee, possibly extending up into Virginia (USFWS, 1990; 2021a). Northern flying squirrels occur in eastern West Virginia, throughout the Northeast and upper Midwest, across much of Canada, into Alaska, south into the northern Rocky Mountains, and along the Pacific Coast into California (IUCN, 2021).
Habitat: The Carolina northern flying squirrel inhabits conifer-hardwood mosaics consisting of red spruce (*Picea rubens*), and balsam and Fraser fir (*Abies balsamea* and *A. fraseri*) associated with beech (*Fagus grandifolia*), yellow birch (*Betula alleganiensis*), sugar or red maple (*Acer saccharum*, *A. rubrum*), hemlock (*Tsuga canadensis*), and black cherry (*Prunus serotina*) (USFWS, 1990).
Diet: Carolina northern flying squirrels mostly eat lichens and fungi. Additionally, they eat seeds, buds, fruit, saminate cones, insects, and other animal matter (USFWS, 1990).
Migration: Carolina northern flying squirrels do not migrate or make seasonal shifts in habitat use (USFWS, 1990).
Likelihood for Exposure to Treated Seeds: **None**. Carolina northern flying squirrels are forest-dwellers. Although they consume seeds, they would not venture into habitats similar to freshly planted row-crop

fields. Therefore, there is no potential for Carolina northern flying squirrels to consume pesticide-treated crop seeds.

Columbian White-tailed Deer *(Odocoileus virginianus leucurus)*

Conservation Status: Threatened (USFWS, 2020a).
Focal Crop Overlap: Canola/rape, cereal grains, corn, sugarbeets.
Range: This subspecies occurs in two separate areas, the Columbia River population in southwestern Washington and the Roseburg population in southwestern Oregon (USFWS, 1983; 2021a). The full range for white-tailed deer extends from extreme southern Northwest Territories, across Canada, south throughout most of Continental U.S., through Mexico and Central America, and into South America. The only areas of the U.S. outside the range of the white-tailed deer are portions of the Rocky Mountains, the Intermountain West, Southwest, and much of California (IUCN, 2021).
Habitat: The Columbia River population inhabits certain islands and bottomlands within an 18 mile stretch of the lower Columbia River. The native vegetation of the Columbia white-tailed deer range consists of a dense, tall shrub or tree community containing Sitka spruce (*Picea sitchensis*), dogwood (*Cornus stolonifera*), cottonwood (*Populus trichocarpa*), red alder (*Alnus rubra*), and willow (*Salix* spp.). Most of the bottomlands have been cleared and planted to grasses and forbs for hay, silage, and grazing for cattle. The range of the Roseburg populations consists of grassland, grass-shrub, oak-savannah, open oak woodlands, closed oak forest, oak-conifer forest, oak-madrone woodland, madrone woodland, riparian, and confir forests. The dominant tree is Oregon white oak (*Quercus garryana*) along with California black oak (*Quercus kelloggii*) and Douglas fir (*Pseudotsuga menziesii*). Riparian zones are dominated by red alder with big-leaf maple (*Acer macrophyllum*) (USFWS, 1983).
Diet: The diet for both populations of Columbia white-tailed deer consists primarily of herbaceous forage. Columbia white-tailed deer forage in pastures, but always within 250 meters of woodlands. Columbia white-tailed deer are considered primarily grazers, but also browse on woody vegetation (USFWS, 1983). White-tailed deer in the Northwest are known to consume grain and other agricultural crops (Gerlach *et al.*, 1994).
Migration: Columbia white-tailed deer do not migrate but demonstrate seasonal shifts in habitat use (USFWS, 1983).
<u>Likelihood for Exposure to Treated Seeds</u>: **Unlikely**. Columbia white-tailed deer are not known to utilize row crop fields for forage, but white-tailed deer elsewhere in the Northwest will consume grains. Therefore, inadvertent consumption of some grain treated with pesticides is possible, but unlikely.

Florida Salt Marsh Vole *(Microtus pennsylvanicus dukecampbelli)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Cereal grains, corn, rice, and sorghum.
Range: This subspecies occurs along the central Gulf Coast of Florida from one site in Waccasassa Bay, near Cedar Key, Levy County (USFWS, 1997b; 2021a). The full species, meadow vole, range includes an area in the western peninsula of Florida and extends from South Carolina and norther Georgia, north into Canada, across the Midwest and Plain states, to the Rocky Mountains, and most of Alaska (IUCN, 2021).
Habitat: The Florida salt marsh vole is known only to occur in salt marsh habitat where the vegetation is dominated by salt grass (*Distichlis spicata*) with smooth cordgrass (*Spartina alterniflora*) and glasswort (*Salifornia* spp.) (USFWS, 1997b).
Diet: The only information regarding their diet is that Florida salt marsh voles eat a variety of plant matter including bark, grass, roots, and seeds (USFWS, 1997b).
Migration: Florida salt marsh voles do not migrate or make seasonal shifts in habitat use (USFWS, 1997b).
<u>Likelihood for Exposure to Treated Seeds</u>: **None**. Florida salt marsh voles occur in a single coastal location away from any row-crop fields. Although they consume seeds, they would not venture into habitats similar to freshly planted row-crop fields. Therefore, there is no potential for Florida salt marsh voles to consume pesticide-treated crop seeds.

Gray Wolf *(Canis lupus)*

Conservation Status: **Delisted** (USFWS, 2020a).
Focal Crop Overlap: Canola/rape, cereal grains, corn, rice, sorghum, soybeans, sugarbeets.
Range: The range within the lower 48 states occurs in two separate areas, one in the Upper Peninsula of Michigan and northern Wisconsin and Minnesota and another in the Northwest, including Wyoming, Montana, and Idaho along with portions of eastern Washington and Oregon, and northern California (USFWS, 2021a). The full range for gray wolves in North America extends from Alaska and across most of Canada, south into the Continental U.S. in the Rocky Mountains, Cascade Range, and Sierra Nevada Range, and into Mexico. The range also extends across much of Asia and Europe (IUCN, 2021).
Habitat: In the Northern Rocky Mountains, gray wolves focus on forested areas with abundant prey and avoid those areas with human activity, including areas with cattle and higher road density (Houts, 2001; Oakleaf *et al.*, 2006). In the upper Midwest, wolf packs favor mixed hardwood-conifer forests and forested wetlands and avoid agricultural areas (Mladenoff *et al.*, 1995).
Diet: Gray wolf diets in North America consist primarily of large and medium-sized ungulates, followed by medium-sized mammals. Other prey include rodents and other small mammals. Fruits, berries, plant material, and garbage are listed as diet components, but seeds were not reported in any studies (USFWS, 1992; Ciucci *et al.*, 1996; Müller, 2006; Newsome *et al.*, 2016; Shave *et al.*, 2020). Vegetation is identified commonly in Mexican wolf diets (Carrera *et al.*, 2008), so it is possible that seeds would be included in that category. Therefore, it is possible that gray wolves consume seeds as a minor component of their overall diet.
Migration: Gray wolves are not migratory, but movements corridors are necessary to provide immigration/emigration among different populations (USFWS, 1992).
<u>Likelihood for Exposure to Treated Seeds</u>**: Unlikely**. Gray wolves consume vegetation, but seeds are not identified as specific or intentional components of the diet. Gray wolves focus on forested areas and avoid areas with human activity such as agricultural areas. With no evidence that gray wolves will select seeds as a diet item and that wolves avoid agricultural areas, consumption of recently planted treated seeds is unlikely.

Grizzly Bear *(Ursus arctos horribilis)*

Conservation Status: Threatened (USFWS, 2020a).
Focal Crop Overlap: Canola/rape, cereal grains, corn, sorghum, soybeans, sugarbeets.
Range: This subspecies occurs in two separate areas, one in northwestern Montana into extreme north Idaho and another in southwestern Montana into northwestern Wyoming (USFWS, 2021a). The full range for brown bears extends from Alaska, across western Canada, south into the Continental U.S. in the Rocky Mountains, Cascade Range, and Sierra Nevada Range, and into Mexico. The range also extends across much of northern Asia and Europe (IUCN, 2021).
Habitat: Most grizzly bears are found in areas of contiguous, relatively undisturbed mountainous habitat having a high degree of topographic and vegetative diversity. Habitat consists of a mixture of forested areas, sometime quite dense, but also includes openings frequently used for foraging. Denning sites exist on steep slopes where deep snow will accumulate and not melt during periodic warm periods (USFWS, 1993b).
Diet: Grizzly bears are opportunistic feeders and prey upon or scavenge almost any available food including ground squirrels, ungulates, carrion, and garbage. Other foods in the diet include roots, bulbs, tubers, fungi, and tree cambium. In some areas, berries, nuts, and fish are important (USFWS, 1993b). Grains and other agricultural crops are included as potential food resources (USFWS, 2021b).
Migration: Grizzly bears are not migratory in the traditional sense, but long-distance movements are possible providing “connections” among different populations (USFWS, 2021b).
<u>Likelihood for Exposure to Treated Seeds</u>: **Unlikely**. Although agricultural crops such as grains are included as potential food resources, grizzly bears generally avoid agricultural areas. Foraging normally occurs where forested areas are nearby precluding most recently planted row crop fields from use as foraging sites. Consumption of grains or other crops is generally spilled grain or mature crops, not recently planted seeds.

Mexican Wolf *(Canis lupus baileyi)*

Conservation Status: **Delisted** (USFWS, 2020a).
Focal Crop Overlap: Canola/rape, cereal grains, corn, cotton, sorghum.
Range: This subspecies' range is limited to an area along the border between Arizona and New Mexico (USFWS, 2017a; 2021a). The full range for gray wolves in North America extends from Alaska and across most of Canada, south into the Continental U.S. in the Rocky Mountains, Cascade Range, and Sierra Nevada Range, and into Mexico. The range also extends across much of Asia and Europe (IUCN, 2021).
Habitat: Mexican wolves strongly favor areas with forest cover and high ungulate density and avoid areas with low forest cover and high human activity. In Arizona and New Mexico, these features occur at higher elevations, generally above approximately 5000 ft. (USFWS, 2017b).
Diet: Mexican wolves are principally predators of large ungulates such as deer and elk. Other prey include rodents and other medium or small mammals. Birds, insects and vegetation are listed as diet components, but seeds were not reported in any studies (USFWS, 2017b; Carrera *et al.*, 2008; Reed *et al.*, 2006). Therefore, it is possible that Mexican wolves consume seeds as a minor component of their overall diet.
Migration: Mexican wolves are not migratory, but movements corridors are necessary to provide immigration/emigration among different populations (USFWS, 1992).
<u>Likelihood for Exposure to Treated Seeds</u>: **Unlikely**. Mexican wolves consume vegetation, but seeds are not identified as specific or intentional components of the diet. Mexican wolves focus on forested areas, likely at higher elevations, and avoid areas with human activity such as agricultural areas. With no evidence that Mexican wolves will select seeds as a diet item and that wolves avoid agricultural areas, consumption of recently planted treated seeds is unlikely.

New Mexico Meadow Jumping Mouse *(Zapus hudsonius luteus)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Canola/rape, cereal grains, corn, cotton, sorghum.
Range: This subspecies occurs in eastern Arizona, south-central New Mexico, and central to northern New Mexico into southern Colorado (USFWS, 2021a). The full range for meadow jumping mice extends from southern Alaska, across much of Canada, and in the U.S. east of the Rocky Mountains across the Plain States to the East Coast and into the Southeast (IUCN, 2021).
Habitat: New Mexico meadow jumping mice is a riparian obligate (Wright and Frey, 2014) inhabiting tall (averaging at least 61 cm (24 in)), dense, riparian herbaceous vegetation primarily composed of sedges and forbs. This habitat exists only where wetland vegetation achieves full growth potential and is associated with seasonally available or perennial flowing water. In addition, individual jumping mice need intact upland areas that are up gradient and beyond the floodplain of rivers and streams and adjacent to riparian wetland areas, because this is where they build nests or use burrows to give birth to young in the summer and to hibernate over the winter (USFWS, 2014b).
Diet: The diet includes seeds and insects (USFWS, 2014b). Insects might be a minor component of the diet with the majority of the diet comprised of seeds from sedges and grasses (Wright and Frey, 2014).
Migration: New Mexico meadow jumping mice do not migrate, but rather hibernate for the winter (Wright and Frey, 2014).
<u>Likelihood for Exposure to Treated Seeds</u>: **None**. Since New Mexico meadow jumping mice are riparian obligates inhabiting wet meadows and other wetlands consisting of sedges and forbs, there is no opportunity for them to encounter freshly planted row crop seeds treated with pesticides.

Northern Idaho Ground Squirrel *(Urocitellus brunneus brunneus)*

Conservation Status: Threatened (USFWS, 2020a).
Focal Crop Overlap: Canola/rape, cereal grains, corn, sugarbeets.
Range: This subspecies occurs in a few areas of east-central Idaho near the Oregon border (IUCN, 2021; USFWS, 2021a).
Taxonomy: Some dispute exists regarding the taxonomic status of the northern Idaho ground squirrel. Hoisington-Lopez *et al.* (2012) argue northern Idaho ground squirrels should be considered a full species

(*Urocitellus brunneus*), but ITIS (2021) currently retains northern Idaho ground squirrel (*Urocitellus brunneus brunneus*) as a subspecies of the Idaho ground squirrel. The USFWS (https://ecos.fws.gov/ecp/species/2982) reports the northern Idaho ground squirrel as (*Urocitellus brunneus*).
Habitat: Northern Idaho ground squirrels inhabit shallow, dry rocky meadows usually associated with deeper, well-drained soils and surrounded by ponderosa pine (*Pinus ponderosa*) and Douglas-fir forests at elevations of about 915 to 1,650 meters (3,000 to 5,400 feet) with potentially suitable habitat up to 1,830 meters (6,000 feet) (USFWS, 2003).
Diet: The diet includes seeds of forbs, lupines, and composites are important, while roots, bulbs, leaf stems, and flower heads are a minor component of their diet with grasses and seeds being especially important (USFWS, 2003).
Migration: Not migratory (USFWS, 2003).
Likelihood for Exposure to Treated Seeds: **Unlikely**. Since northern Idaho ground squirrels inhabit meadows surrounded by coniferous forests, it is unlikely they would encounter seeds treated with pesticides prior to or just after planting.

Pacific pocket mouse *(Perognathus longimembris pacificus)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Cereal grains and sorghum.
Range: This subspecies endemic to the immediate coast of southern California from Marina del Rey and El Segundo in Los Angeles County, south to the vicinity of the Mexican border in San Diego County. The subspecies has not been reported more than 4 kilometers (2.5 miles) from the ocean (USFWS, 1998d; 2021a). The full range for the little pocket mouse extends south into Mexico, up the San Joaquin Valley, in southern Utah north to west of the Great Salt Lake, and throughout much of the Great Basin (IUCN, 2021).
Habitat: Pacific pocket mice occur on fine-grain, sandy or gravelly substrates within coastal sage scrub in the immediate vicinity of the Pacific Ocean (USFWS, 1998d).
Diet: The diet is mainly seeds and stems of grasses along with forbs, as well as arthropods and larvae (USFWS, 1998d).
Migration: Pacific pocket mice do not migrate, but likely hibernate (USFWS, 1998d).
Likelihood for Exposure to Treated Seeds: **None**. Pacific pocket mice consume large quantities of seeds. However, their habitat is solely sandy coastal sage scrub near the Pacific Ocean away from agricultural areas. Therefore, they would have no opportunity to encounter freshly planted seeds in row-crop fields.

Peñasco least chipmunk *(Tamias minimus atristriatus)*

Conservation Status: Candidate (USFWS, 2020a).
Focal Crop Overlap: Cereal grains, cotton.
Range: This subspecies occurs in south-central New Mexico (USFWS, 2021a). The full range for the least chipmunk extends throughout much of the Rocky Mountain region, east into Nebraska and the Dakotas; west into California, Washington, and Oregon; and north through much of Canada (IUCN, 2021).
Habitat: Peñasco least chipmunks occupy high-elevation talus slopes and ponderosa pine forest (*Pinus ponderosa*) in the Mescalero Apache Reservation and Lincoln National Forest (USFWS, 2015b).

Diet: The diet is mainly seeds of shrubs and forbs, as well as arthropods, leaves, fruits, flowers and fungi (USFWS, 2015b).

Migration: Peñasco least chipmunks do not migrate (USFWS, 2015b).
Likelihood for Exposure to Treated Seeds: **None**. Peñasco least chipmunks primarily consume seeds. However, their habitat is solely in high mountain forests or above tree line. Therefore, they would have no opportunity to encounter freshly planted seeds in row-crop fields.

Preble's Meadow Jumping Mouse *(Zapus hudsonius preblei) invalid ITIS*

Conservation Status: Threatened (USFWS, 2020a).

Focal Crop Overlap: Cereal grains, corn, sorghum, soybeans, sugarbeets.
Range: This subspecies occurs in central Colorado, north into eastern Wyoming (USFWS, 2021a). The full range for meadow jumping mice extends from southern Alaska, across much of Canada, and in the U.S. east of the Rocky Mountains across the Plain States to the East Coast and into the Southeast (IUCN, 2021).
Habitat: Preble's meadow jumping mice typical habitat consists of well-developed riparian vegetation, relatively undisturbed adjacent grassland communities, and a nearby water source. Habitat for the Preble's meadow jumping mouse ranges from large perennial rivers such as the South Platte River to small ephemeral drainages only 3 to 10 feet wide such as those found at Rocky Flats Environmental Technology Site to montane habitats, low moist areas, dry gulches, agricultural ditches, and wet meadows and seeps near streams (USFWS, 2018b).

Diet: The diet includes arthropods, fungus, moss, pollen, willow (*Salix* spp.), lamb's quarters (*Chenopodium* sp.), Russian thistle (*Salsola* sp.), sunflowers (*Helianthus* spp.), sedge (*Carex* spp.), mullein (*Verbascum thapsus*), grasses (*Bromus, Festuca, Poa, Sporobolus* and *Agropyron* spp.), bladderpod (*Lesquerella* sp.), rushes (*Equisetum* sp.), and assorted seeds (USFWS, 2018b).

Migration: Preble's meadow jumping mice do not migrate, but rather hibernate for the winter (USFWS, 2018b).
<u>Likelihood for Exposure to Treated Seeds</u>: **Unlikely**. Since Preble's meadow jumping mice primarily inhabit wet meadows and other wetlands consisting of grasses and shrubs, there is no opportunity for them to encounter freshly planted row crop seeds in those habitats. However, since they also inhabit areas with hayfields and agricultural ditches, there is at least some possibility they could encounter treated seeds intended for planting in row crop fields.

Riparian woodrat *(Neotoma fuscipes riparia)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Cereal grains, corn, cotton, rice, and sorghum.
Range: This subspecies range is currently restricted to about 250 acres of riparian forest on the Stanislaus River in Caswell Memorial State Park (USFWS, 1998c; 2021a). The full range of dusky-footed woodrats extends south from near Portland, OR through western Oregon, throughout much of northern California, south through the west side of the San Joaquin Valley (IUCN, 2021).
Habitat: Habitat for this species consists of areas of deciduous valley oaks but few live oaks. Riparian woodrats are most abundant where shrub cover is dense and least abundant in open areas. They build nests commonly in willow thickets with an overstory of oaks (USFWS, 1998c; 2000).
Diet: The riparian woodrat is a generalist herbivore, consuming a wide variety of nuts, fruit, foliage, terminal shoots of twigs, fungi, and some forbs (USFWS, 1998c; 2000a).
Migration: Riparian woodrats do not migrate or make seasonal shifts in habitat use (USFWS, 1998c).
<u>Likelihood for Exposure to Treated Seeds</u>: **Unlikely.** Riparian woodrats do not focus on seeds as a major component of their diet, but likely consume seeds along with the rest of the herbivorous diet. Their habitat is specific to riparian oak woodlands with a dense shrub understory. The San Joaquin Valley has a lot of irrigated agricultural lands, so it is possible that riparian woodrats might venture into adjacent row-crop fields and consume treated seeds.

Salt marsh harvest mouse *(Reithrodontomys raviventris)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Canola/rape, cereal grains, corn, cotton, rice, and sorghum.
Range: This species range is in the San Francisco Bay area (USFWS, 2013c; 2021a; IUCN, 2021).
Habitat: Habitat for this species consists of tall, dense, continuous stands of pickleweed (*Sarcocornia pacifica*) in saline soil. These stands remain mostly unsubmerged during periods of flooding, or are mixed with other unsubmerged sources of cover, such as taller vegetation (*e.g.* gumplant; *Grindelia* sp.). A canopy height of about 6 inches is the minimal commonly used by salt marsh harvest mice (USFWS, 2013c).

Diet: Salt marsh harvest mice have an omnivorous diet consisting of vegetation and insects and amphipods and is seasonally flexible reflecting food availability during different seasons (Smith and Kelt, 2019).
Migration: Salt marsh harvest mouse do not migrate or make seasonal shifts in habitat use (USFWS, 2013c).
Likelihood for Exposure to Treated Seeds: **None**. Salt marsh harvest mice do not focus on seeds as a major component of their diet, but likely consume seeds along with the rest of the omnivorous diet. Their habitat is specific to tidal or diked saline marshes. Such a habitat restriction would preclude the salt marsh harvest mouse from encountering freshly planted treated row-crop seeds.

San Bernardino kangaroo rat *(Dipodomys merriami parvus)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Canola/rape, cereal grains, corn, cotton, sorghum, and sugarbeets.
Range: This subspecies occurs in the San Bernardino, Menifee, and San Jacinto valleys in San Bernardino and Riverside Counties (USFWS, 2009; 2021a). The full range for the Merriam's kangaroo rat extends from the Great Basin in Nevada, south through the Mojave Desert in California, east to western Texas, and south into Mexico (IUCN, 2021).
Habitat: San Bernardino kangaroo rats occur alluvial fan sage scrub with sandy soils and relatively open vegetation. The San Bernadino kangaroo rats favor the intermediate terraces with relatively open vegetation. They rarely occur in dense vegetation but are more common in areas with low shrub canopy cover (USFWS, 1998e; 2009).
Diet: The diet is mainly seeds, along with green vegetation and insects (USFWS, 1998e; 2009).
Migration: San Bernardino kangaroo rats do not migrate (USFWS, 1998e; 2009).
Likelihood for Exposure to Treated Seeds**: None.** Pacific pocket mice consume large quantities of seeds. However, their habitat is solely alluvial sage scrub away from agricultural areas. Therefore, they would have no opportunity to encounter freshly planted seeds in row-crop fields.

Sonoran Pronghorn *(Antilocapra americana sonoriensis)*

Conservation Status: Endangered (USFWS, 2020a).
Focal Crop Overlap: Cereal grains, corn, cotton, sorghum, soybeans, sugarbeets.
Range: Sonoran pronghorn have a designated range in southwestern Arizona and extending into northern Mexico (USFWS, 2016b; 2021a). The full species range extends throughout much of the West from the Dakotas south through Nebraska and eastern Kansas, into areas of Texas, and west to northern Nevada (IUCN, 2021).
Habitat: Sonoran pronghorn inhabit two of the five subdivisions of the Sonoran Desert: the Lower Colorado River Valley Subdivision and the Arizona Upland Subdivision. Sonoran pronghorn most commonly occur in areas of creosote bush (*Larrea tridentata*) and bursage (*Ambrosia* spp.) in the Lower Colorado River Valley Subdivision. In the Arizona Upland Subdivision, they inhabit areas that are largely arboreal and dominated by leguminous trees such as paloverde (*Cercidium* spp.), ironwood (*Olneya tesota*), mesquites (*Prosopsis* spp.), and cat-claw acacia (*Acacia greggii*) (USFWS, 2016b).

Diet: Sonoran pronghorn forage on a variety of desert plants. The diet includes seeds consumed along with other plant parts (USFWS, 2016b).

Migration: Sonoran pronghorn move approximately 80 miles (130 km) between hot-season habitats and cool season habitats (USFWS, 2016b).
Likelihood for Exposure to Treated Seeds: **Unlikely**. Sonoran pronghorn consume seeds, but are not known specifically to consume crop seeds. Agriculture is listed as a threat to Sonoran pronghorn (USFWS, 2016b), so they are not likely to utilize agricultural lands to a large degree. Sonoran pronghorn appear restricted to more native habitats, so they are unlikely to encounter seeds treated with pesticides.

Utah Prairie Dog *(Cynomys parvidens)*

Conservation Status: Threatened (USFWS, 2020a).

Focal Crop Overlap: Cereal grains, corn, sorghum.
Range: Utah prairie dogs occur in central and southwestern Utah (IUCN, 2021; USFWS, 2012; 2021a).
Habitat: Utah prairie dogs inhabit semiarid shrub-steppe and grassland habitats, especially swale-type formations where moist herbaceous vegetation is available even during periods of drought. Well-drained soil is necessary to allow burrowing down to approximately 3 feet (1 meter) (USFWS, 2012c).

Diet: Utah prairie dogs are predominantly herbivores, though they also eat insects such as cicadas (*Cicadidae*). Grasses are a staple of the annual diet during different times of the year. Utah prairie dogs only select shrubs when they are in flower, and then only eat the flowers. Forbs are consumed in the spring, and there is a preference for alfalfa over grasses when both are present. Utah prairie dogs consume agricultural crops such as alfalfa and will consume grains when available as demonstrated by consumption of grains in supplemental feed for newly released individuals (USFWS, 2012c).
Migration: Migration consists of movement among colonies or populations, not regular seasonal movements among habitats (USFWS, 2012c).
<u>Likelihood for Exposure to Treated Seeds</u>: **Unlikely**. Utah prairie dogs consume those seeds associated with forage plants, such as alfalfa, but do not generally consume seeds from the ground. Utah prairie dogs are associated with crops such as alfalfa, but are not known to occur frequently in barren, freshly planted row crop fields.

Other mammalian species

There were numerous other species listed in the BE as LAA that are not known to consume seeds of any kind. These species include (with references):

- **Killer whale (*Orcinus orca*) –** Marine species
- **Black-footed ferret (*Mustela nigripes*) –** USFWS, 2013a
- **Canada Lynx (*Lynx canadensis*) -** Burstahler *et al.*, 2016; Ivan and Shenk, 2016
- **Florida bonneted bat (*Eumops floridanus*)** – USFWS, 2018a
- **Gray bat (*Myotis grisescens*) –** USFWS, 1982
- **Gulf Coast jaguarundi (*Herpailurus (=Felis) yagouaroundi cacomitli*) –** USFWS, 2013b
- **Hawaiian hoary bat (*Lasiurus cinereus semotus*) –** USFWS, 1998
- **Indiana bat (*Myotis sodalist*) –** USFWS, 2007
- **Mexican long-nosed bat (*Leptonycteris nivalis*) –** USFWS, 1994
- **Northern Long-Eared Bat (*Myotis septentrionalis*) –** USFWS, 2015a
- **Ocelot (*Leopardus (=Felis) pardalis*) –** USFWS, 2016a
- **Ozark big-eared bat (*Corynorhinus (=Plecotus) townsendii ingens*) –** USFWS, 1984; 1995b
- **Pacific Marten, Coastal Distinct Population Segment (*Martes caurina*)** – USFWS, 2020b
- **San Joaquim kit fox** – USFWS, 1998c
- **Virginia big-eared bat (*Corynorhinus (=Plecotus) townsendii virginianus*) –** USFWS, 1984

We assume that these determinations were therefore related to non-seed treatment uses of clothianidin.

The following species only occur in counties that do not grow crops grow from clothianidin-treated seeds:

- Key Largo cotton mouse (*Peromyscus gossypinus allapaticola*)
- Key Largo woodrat (*Neotoma floridana smalli)*
- Silver rice rat (*Oryzomys palustris natator)*

All three of these species are restricted to the southern tip of Florida or the Florida Keys, where none of the focal crops are grown (USFWS, 2021a) and therefore, there is no possibility of any of these species consuming a clothianidin-treated seed.

Aquatic Assessment

Exclusion of seed treatment aquatic EECs

EPA notes in Chapter 3 (*section 3.5.5*) of the draft BE that foliar and soil treatment applications of clothianidin will generate much higher EECs than those from seed treatment applications. As a conservative estimate of exposure, foliar treatments were considered protective for all seed treatment uses except corn, grains (barley, wheat, etc.) and guayule seed. For corn and grains, EECs from treated poultry litter were considered. While EPA does not report the seed treatment EECs in the draft BE, the modeling results are summarized in the modeling results file available as Appendix 3-2 (accessible via internet: https://www3.epa.gov/pesticides/nas/neonicdraftbe/clothianidin/appendix3-2.zip). These seed treatment modeling results were extracted from the summary files and are discussed below.

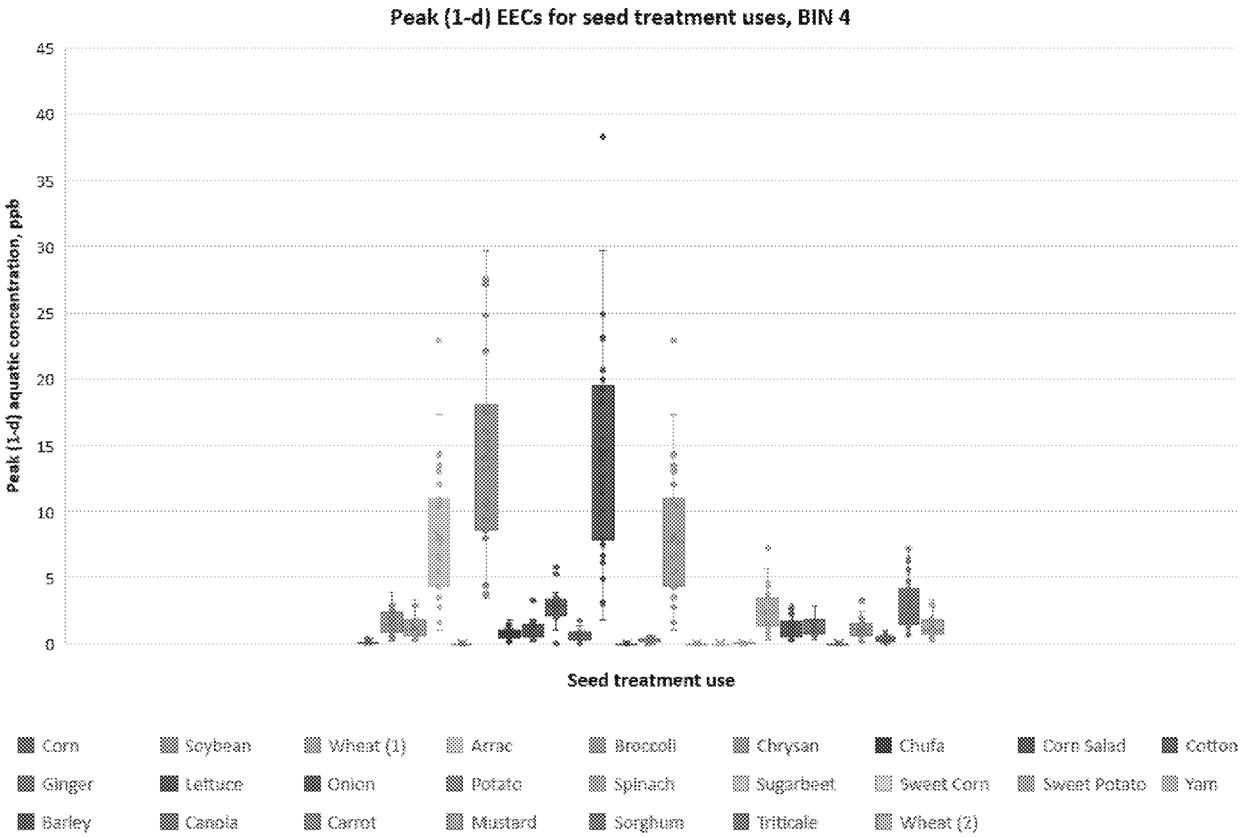
Comparing seed treatment EECs to the EECs reported in the draft BE (*i.e.*, those based on foliar/poultry litter applications) does indicate a substantial difference in aquatic EECs, which becomes more pronounced when comparing individual crops. For example, reported peak EECs for corn are up to 137x higher than for the corresponding seed treatment. This was also noted by EPA in Appendix 4-5. The table below is based on EECs extracted from the modeling output summaries and compares the daily average EECs as reported with EECs from the primary BASF seed treatment uses.

	Range of 1-in-15 year Daily Average EECs (µg/L)						
	Bin 1	**Bin 2**	**Bin 3**	**Bin 4**	**Bin 5**	**Bin 6**	**Bin 7**
As reported by EPA in draft BE (foliar, poultry litter EECs)	1.1 - 109	2 - 275	0.11 - 46	0.11 - 46	2 - 275	0.08 – 37	0.08 – 37
Seed* - CORN	--	0 - 2	0 - 0.35	0 - 0.35	0 - 2	0.27 - 0.27	0.27 - 0.27
Seed* - COTTON	--	0 - 53	0 - 5.8	0 - 5.8	0 - 53	0 - 4.5	0 - 4.5
Seed* - CEREALS	--	0 - 53	0.21 - 7.3	0.21 - 7.3	0 - 53	0 - 7.0	0 - 7.0
Seed* - SOYBEAN	--	0 - 31	0 - 3.9	0 - 3.9	0 - 31	0 - 3.4	0 - 3.4

*Clothianidin seed treatment EECs were not reported in the draft BE, although they were modeled by EPA and summarized in Appendix 3-2. The seed treatment EECs presented here were extracted from those modeling results files in Appendix 3-2.

While it is reasonable to assume the highest application rate within a given use pattern, BASF maintains that it is unreasonably conservative to assume coverage across different use patterns (*i.e.*, considering foliar or poultry litter applications as representative for seed treatment). Furthermore, many crops have a maximum total application rate of clothianidin per acre per year, regardless of type of application. The modeling inputs from the provided PWC batch file (Appendix 3-1) modeled an application rate of 0.5488 kg/ha (*ca.* 0.49 lb/A), based on the worst-case poultry litter application rate. Assuming that the seed treatment application occurs at such a high rate is inconsistent with the seed treatment label and predicts far higher aquatic concentrations than should be realistically anticipated from this use. We recommend that EFED include the (already calculated) seed treatment EECs in the biological evaluation in order to transparently assess the different exposure potentials across all clothianidin uses.

In addition, it would be highly informative to present the aquatic concentrations crop by crop, as there can be large differences even among the seed treatment uses. The figure below presents the range of seed treatment peak (1-day) aquatic EECs for Bin 4, separated by crop.



In this case, the highest aquatic exposure concentrations are clearly driven by only four of the 25 seed treatment uses – arracacia, chrysanthemum, lettuce, and spinach considered in the draft BE, which can lead to erroneous conclusions about the potential aquatic exposure from all seed treatment uses. Therefore, in addition to presenting the seed treatment uses, these should be presented individually in order to better assess aquatic exposure potential.

Aquatic Invertebrate Toxicity Endpoint for the Aquatic Organism Risk Assessment

To develop a scientifically defensible aquatic organism risk assessment, it is critical that ecotoxicological endpoints from the most appropriate scientifically valid studies be used. Depending on the compound and the data set available, the most appropriate value could be the lowest endpoint (e.g., LC50 or no observed effect concentration (NOEC)) from the most sensitive species tested under laboratory conditions, or depending on the available data set, higher-tier studies conducted under more realistic environmental conditions (e.g., mesocosm studies).

The endpoint of the most sensitive species used by the US EPA -- derived from a single study by Cavallaro *et al.* 2017 (NOEC = 0.05 µg ai/L) -- does not meet basic scientific validity criteria for use in science-based risk management decisions because it is not repeatable by the same laboratory (Maloney *et al.* 2018), cannot be independently validated (Raby *et al.* 2018), and is not supported by higher tier studies (Hartgers and Roessink 2015).

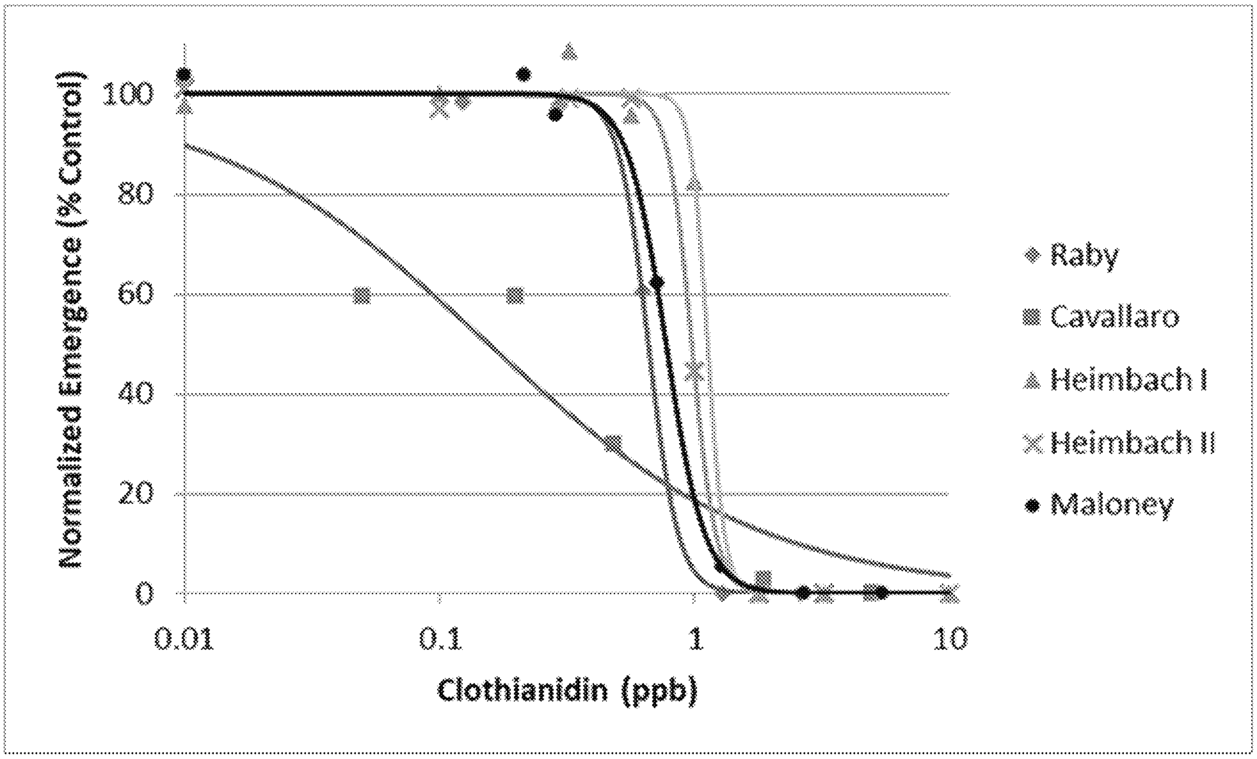
In addition, the endpoint from the Cavallaro study is more than an order of magnitude lower than endpoints derived for the same effect (i.e., midge emergence) in four independent studies – performed at two independent laboratories and one performed within the same laboratory – resulting in an insupportably low NOEC value. As illustrated in Table 1 below, four studies performed across different laboratories produced consistent endpoints for the most sensitive species -- midge (*Chironomus*) -- emergence (i.e., endpoints within ~2x range that accounts for possible inter and intra laboratory variability) that are more than an order of magnitude greater than the endpoint reported by Cavallaro *et al.* 2017. Of these four studies, two were performed with the same species (Maloney *et al.* 2018; Raby *et al.* 2018), and two were performed with a different species but similar genus, *Chironomus riparius* instead of *Chironomus dilutus* (Heimbach 1999a; Heimbach 1999b). Notably, one of these four studies (Maloney *et al.* 2018) was performed in the same laboratory and authored by some of the same researchers as the Cavallaro *et al.* 2017 study.

Table 1: Comparison of Lowest *C. dilutus* Emergence Endpoints Demonstrates Cavallaro *et al.* 2017 is not reliable

Study	**Midge Species**	**Emergence Endpoint**	**Study Duration (days)**
Cavallaro *et al.* 2017	*Chironomus dilutus*	NOEC < 0.05 µg ai/L	40
Maloney *et al.* 2018	*Chironomus dilutus*	EC20 = 0.34 µg ai/L	28
Raby *et al.* 2018	*Chironomus dilutus*	EC10 = 0.42 µg ai/L	56
Heimbach 1999a	*Chironomus riparius*	EC10 = 0.65 µg ai/L	28
Heimbach 1999b	*Chironomus riparius*	NOEC = 0.56 µg ai/L	28

Figure 1 below demonstrates that four of the five studies referenced in Table 1 (i.e., all but Cavallaro *et al.* 2017) show a consistent response with regards to midge emergence following chronic exposure to clothianidin. The deviation of the Cavallaro *et al.* 2017 data is not due to differences associated with clothianidin exposure but rather likely explained by control bias, rendering its results invalid. Due to the consistent inability to reproduce the results from Cavallaro *et al.* 2017, and consistent findings across four other studies, the Cavallaro *et al.* endpoint should not be considered in science-based risk management decisions.

Figure 1: Comparison of Observed Midge Emergence Response from Available Studies



The length of clothianidin exposure to the species does not explain the lower endpoint reported by Cavallaro *et al.* 2017 as compared to the other available chronic midge studies, in particular Raby *et al.* 2018 which was 16 days longer than the Cavallaro *et al.* 2017 study. While study duration does not necessarily correlate to exposure duration, it does in the case of these two studies.

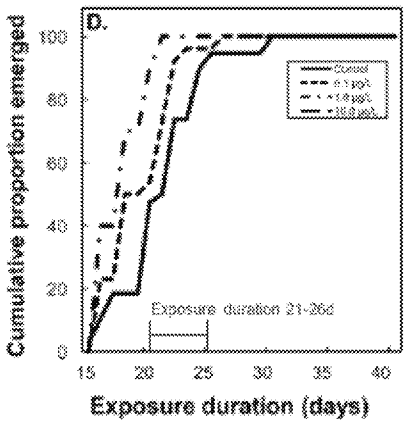
The relevant exposure for this endpoint is the time the organisms are in the test solution prior to emergence. Midge (*Chironomus dilutus* and *Chironomus riparius*) spend the juvenile portion of their life cycle in aquatic environments and emerge to terrestrial flying organisms when they become adults. The chronic midge studies included in Table 1 are performed by spiking the water of a test vessel with clothianidin in order to expose the midge during their juvenile life stage. When the organisms mature into adults they emerge from the artificially contaminated aquatic environment so they are no longer exposed to the test solution. The 0.05 µg ai/L endpoint used by US EPA derived from Cavallaro *et al.* 2017, and the other endpoints listed in Table 1 are based on percent midge emergence (i.e., when the organisms leaves the aquatic test solution).

Exposure duration is the time from initiation of clothianidin exposure to the time organisms emerge from the test solution. Figure 2 presents the exposure durations for the Cavallaro *et al.* 2017 and Raby *et al.* 2018 studies for treatment levels that had adults emerge. The 0.3 µg ai/L treatment level from the Cavallaro *et al.* 2017 study is not graphed due to overlap with other concentrations. In the Raby *et al.* 2018 publication, the authors define the start of the study as the day organisms for the study hatched and not the day exposure was initiated, which occurred 10 days later. Therefore, durations presented by Raby *et al.* 2018 were adjusted by 10 days to accurately reflect the exposure durations and the corrected durations are presented in the figure below.

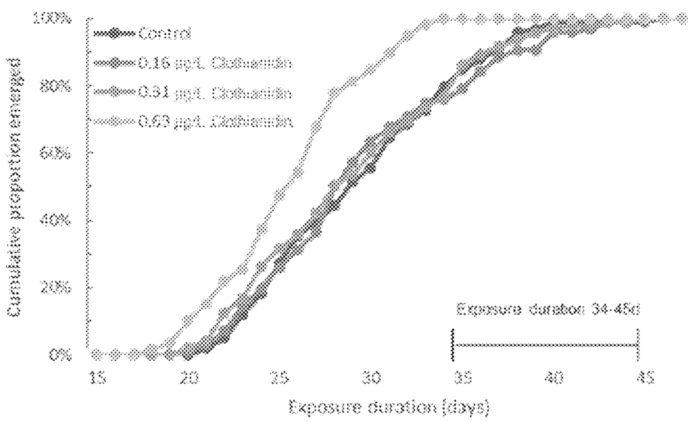
As Figure 2 demonstrates, the exposures in the Raby *et al.* 2018 study were longer than exposures in the Cavallaro *et al.* 2017. Thus, exposure duration does not explain the lower endpoint reported by Cavallaro *et al.* 2017.

Figure 2: Exposure Duration in Raby et al. 2018b was longer than in Cavallaro et al. 2017

Figure 2 (D) from Cavallaro et al. 2017



Generated from Raby et al. 2018 supplementary data



	Approximate Day			
	1st Emergence	50% Emergence	90th % Emergence	Last Emergence
Control	16	22	25	31
0.1 µg ai/L	16	18	22	26
0.3 µg ai/L	?	?	?	?
1.0 µg ai/L	16	18	21	21

0.3 µg ai/L not graphed in pub due to overlap with other lines

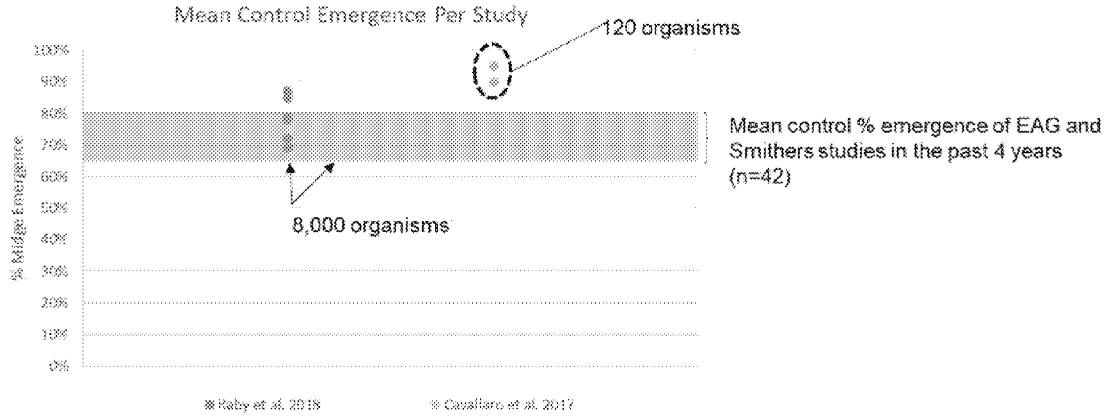
	Approximate Day			
	1st Emergence	50% Emergence	90th % Emergence	Last Emergence
Control	21	31	37	38
0.16 µg ai/L	20	28	38	44
0.31 µg ai/L	20	28	36	45
0.63 µg ai/L	18	26	31	34

It is possible that control bias explains the unusual results in the Cavallaro *et al.* 2017 study. In this study, percent of midge emergence for clothianidin treatments was compared to four control replicates that were reported to have 100%, 100%, 100%, and 80% emergence respectively (mean 95% emergence). This high level of emergence is not expected for *Chironomus dilutus* as demonstrated by Figure 3 below which compares the control emergence of *C. dilutus* in Cavallaro *et al.* 2017 to studies performed by experts in the field and other researchers (mean emergence of 69-80%).

Figure 3: Percent Emergence of all Control Replicates for Studies Performed by Expert CROs and Researchers

Performer	Sample Size (# of separate studies) [total # of midge]	Mean Emergence	Median Emergence
EAG Laboratories*	20 [3,200]	80%	84%
Smithers*	22 [3,936]	69%	68%
Raby et al. 2018b	6 [864]	78%	79%
Cavallaro et al. 2017	3 [120]	93%	95%

*OCSPP spiked sediment studies with *Chironomus dilutus*
Maloney data requested but not made available.

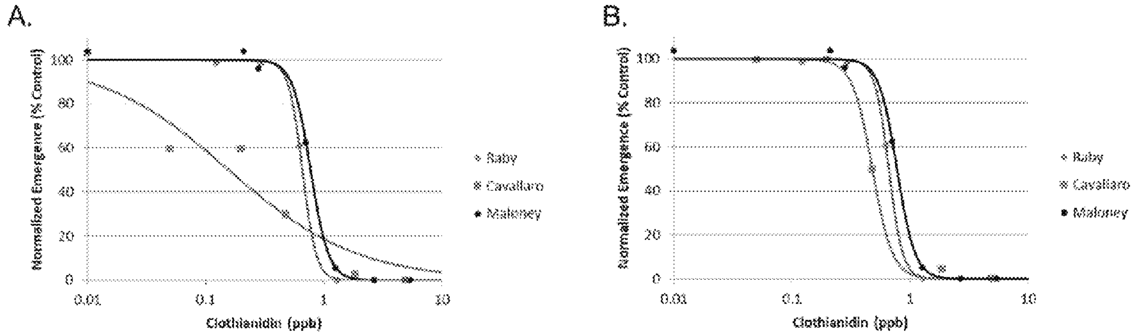


Control replicates are included in studies to represent the baseline (non-exposure) response of a population of organisms such that impacts of test compounds can be distinguished from normal variations. If control organisms do not appropriately reflect the response or variation of the test population then test observations cannot be reliably characterized as treatment or non-treatment related. The dose-response curve for midge emergence from Cavallaro *et al.* 2017, and comparison to the response observed by other studies, demonstrates the Cavallaro *et al.* 2017 controls do not reflect the test population (Figure 4). Cavallaro *et al.* 2017 reports ~45% reduction in emergence relative to the controls at the two lowest treatment levels (0.1 and 0.3 µg a.i./L nominal). These observations do not follow the typical dose-response pattern observed with toxic responses from chemical exposures (i.e., emergence did not decrease with increasing exposure concentration; Figure 4A). Further, Maloney *et al.* 2018 and Raby *et al.* 2018 reported <10 % reduction in emergence relative to controls at these test levels. However, due to the performance of the Cavallaro controls, the responses at these two levels were called treatment related and used to derive the EC20 endpoint for emergence of 0.02 µg a.i./L. Figure 4B illustrates the dose response curve without the control replicates from the Cavallaro *et al.* 2017 study with the full dose response curves for the Maloney *et al.* 2018 and Raby *et al.* 2018 studies.

The responses from the three studies align, providing another line of evidence that the controls for the Cavallaro *et al.* 2017 study are not representative of the test population, and therefore results based on comparisons to the control (i.e., EPA endpoint-based percent emergence of < 0.05 µg a.i./L) are not reliable.

Possible explanations for why the control organisms for the clothianidin study reported by Cavallaro *et al.* 2017 do not reflect the test population include selection, placement, or handling of the organisms in a different manner than the organisms used for the clothianidin test levels which can happen inadvertently if not carefully monitored.

Figure 4: The Super Natural Performance of the Controls in the Cavallaro et al. 2017 study explains the Unreproducible Endpoint



With Cavallaro controls included

Without Cavallaro controls

In summary, we believe that the Cavallaro *et al.* 2017 study is not scientifically valid and not suitable endpoint for the aquatic invertebrate risk assessment for clothianidin. There is an extensive data package on aquatic invertebrate species that is available for clothianidin, which has been summarized and evaluated by both US EPA (US EPA, 2017) and more recently by the Canadian Pest Management Regulatory Authority (PMRA, 2021). In the recent PMRA review, the PMRA used the endpoint for an aquatic mesocosm study (Hartgers and Roessink, 2015) for their community-level aquatic risk assessments. The endpoint from the mesocosm, as determined by PMRA was 0.28 µg ai/L, which is consistent with the data laboratory studies on the most sensitive taxa (i.e., insects), other than the Cavallaro *et al.* 2017 study. We believe that this is a more appropriate endpoint for aquatic invertebrate risk assessments.

Seed treatment stewardship and technology

A key component for the sustainable use of crop protection products is proper stewardship in the handling, application, and disposal of the products to reduce exposure to the applicators and the environment. The crop protection industry is committed to providing our customers with support and resources to properly steward our products and is actively engaged in providing support within the agricultural industry to communicate and increase the awareness for stewardship of crop protection products. This section addresses specific and collaborative efforts BASF participates in for seed treatment stewardship activities. The examples provided are highlights of stewardship activities and are part of a broader range of outreach and education efforts dedicated to growers and applicators in agricultural production.

Use Pattern Stewardship and Application Technology of Clothianidin Seed Treatment

In 2020, EPA released the "Proposed Interim Registration Review Decision" (PID) for Clothianidin and Thiamethoxam. The PID identified potential areas of risk to mitigate exposure from seed treatment use in the environment, worker exposure, and to wildlife and non-target organisms. Key points concerning clothianidin seed treatments included proposing additional Personal Protection Equipment (PPE); additional advisory label language to avoid and clean-up seed spills; and, promoting voluntary stewardship efforts to encourage Best Management Practices (BMP), education, and outreach to applicators and beekeepers.

Advisory statements from EPA for clothianidin seed treatment uses included: 1) Cover or collect treated seeds spilled during loading and planting in areas (such as in row ends); 2) Dispose of all excess treated seed by burying seed away from bodies of water; and 3) Do not contaminate bodies of water when disposing of planting equipment wash water. Current seed treatment labels contain such statements that

have been proposed by EPA. In addition, we amplify these mitigation measures as best management practices with our customers. Educational resources as bulletins, trainings, and social media outreach emphasize the importance of the label statements and steward the proper use of our seed treatment products.
The EPA's PID for clothianidin recognized a route of exposure for honey bees is the drift of abraded seed coat dust (especially corn) resulting in direct contact with residues. EPA has noted that they continue to work with stakeholders to mitigate potential dust-off exposure "through best management practices and development of alternative technologies to reduce dust off during planting (e.g. alternative lubricants, equipment modifications, etc.)".

The potential for pesticide exposure to honey bee colonies located near row crops can occur by contact or ingestion via dust from planting treated seeds primarily with vacuum type pneumatic planters. In 2008 in Germany and planting seasons 2012-2014 in Canada, a large number of honey bee colonies were impacted by dust generated during planting of treated seeds. Due to these past incidents, there is a concerted effort across the agricultural industry to reduce the potential dust-off exposure and the abrasion of treated seed during planting. Mitigation of dust off has resulted in modifications of planting equipment, increased use of new dust-reducing planter lubricants at planting time, improvements of seed coatings, and communication between beekeepers and farmers during planting time.

At BASF, mitigation measures have been incorporated into the development process for formulations to be applied to a seed. A key factor when applying the active ingredient product to the seed is the co-application of a seed coating with dust controlling capabilities. The addition of a seed coating to the seed treatment application should be compatible with the active ingredient and co-applicants, harmless to the seed, and can be applied with existing seed treatment application equipment. In addition to providing dust control for proper stewardship, in most cases a seed coating product is also needed to provide the necessary flowability and plantability of the insecticide treated seed to function correctly with the planting equipment. The use of the proper seed coatings is a foundational and significant component to seed treatment stewardship for BASF products.

Seed coating recommendations are key to the finishing touches of an insecticide seed treatment application. A specific seed coating is developed to be compatible to a seed treatment formulation, and technical recommendations of the application process and proper application rate required are communicated to the applicators. The application process suggested by our Seed Treatment R&D team ensures the best success for not only the application process of the seed coating and seed treatment formulations on the seed, but also, the grower will receive quality treated seed for maximum success in the field.

Stewardship Activities – Industry Organizations and External Collaborations

This section provides information on stewardship activities organized by industry organizations and external collaborations to promote awareness and proper use of crop protection products by growers and applicators. External collaborations consist of diverse stakeholders including industry, trade associations, commodity groups, beekeepers, academia, and non-profit organizations working together to provide guidance on best management practices and outreach to ensure growers, applicators, and in some instances, beekeepers, are mindful of the intersection of agricultural production and the surrounding ecosystem that provides habitat for non-target organisms such as pollinators and other wildlife.

Honey Bee Health Coalition - https://honeybeehealthcoalition.org/ - Collaboration of stakeholders to improve honey bee health by addressing multiple factors influencing bee health. Highlighted tools and resources available:

- Bee Integrated Demonstration Project – Multi-year project bringing beekeepers and producers together to implement best practices in agricultural landscapes to support honey bee health. Project incorporates establishing pollinator forage, monitoring and treating Varroa mites in managed hives, following pollinator protection plans, and utilizing best practices for crop protection products. https://honeybeehealthcoalition.org/bee-integrated-demonstration-project/

- Fact Sheets for Grower's and Beekeeper's Roles https://honeybeehealthcoalition.org/growers-and-beekeepers-role/
- The Bee Understanding Project – videos highlighting job swaps between commercial beekeeper, grower, and crop protection advisor https://honeybeehealthcoalition.org/the-bee-understanding-project/
- Soy Best Management Practices https://honeybeehealthcoalition.org/soybmps/
- Corn Best Management Practices https://honeybeehealthcoalition.org/cornbmps/
- Protecting Honey Bees in Production Agriculture – training module for Crop Consultants, Advisors, and Applicators https://npsec.us/wp-content/uploads/WEB-HBHC-Crop-Pest-Advior-Edu-Slides_July-2018-NoVid.pdf

Pollinator Partnership - https://pollinator.org/ - non-profit organization dedicated to promoting the health of pollinators, critical to food and ecosystems, through conservation, education, and research.

- Protecting Pollinators Training Module for Certified Pesticide Applicators, Pesticide and Crop Advisors, and Agricultural Producers https://pollinator.org/pesticide-education
- Corn Dust Research Consortium (CRDC) – This was a multi-stakeholder initiative with participants from beekeeping, agriculture, manufacturing, research, and regulatory agencies to facilitate research designed to provide practical guidance to reduce honey bee exposure to dust during planting of insecticide treated corn seeds. The results from the CRDC study provided recommendations for farmers, beekeepers, seed dealers, equipment manufacturers, pesticide manufacturers, extension agents, agriculture trade media, commodity groups, and state and federal regulatory officials. Final report published in 2017 https://pollinator.org/cdrc

American Seed Trade Association (ASTA) – resources available from ASTA include:

- The Guide to Seed Treatment Stewardship, (www.seed-treatment-guide.com) is a collaborative effort between the American Seed Trade Association (ASTA) and CropLife America (CLA) and is widely distributed and considered to be the industry standard for seed treatment stewardship practices for growers and applicators. The website provides resources in the form of written guides and videos on topics such as "Ensuring Success through Stewardship of Treated Seed" and "Treated Seed Stewardship for Managing Seed Spills". https://seed-treatment-guide.com/

- https://www.betterseed.org/the-issues/seed-treatment-and-environment/ - includes links to additional information on Seed Treatments, Stewardship, and Pollinator Health

- ASTA conducts training sessions for seed treaters on best management practices as outlined in The Guide to Seed Treatment Stewardship. The training presentations are provided at the ASTA annual CSS meeting, the largest seed conference in the world, and at the state and regional seed and grower meetings annually since 2014. ASTA and other industry groups also host a biennial field demo day for federal government regulatory officials to present stewardship and sustainable farming practices plus highlight equipment and technology innovations utilized by growers.

Growing Matters Coalition

The Growing Matters Coalition is a collaboration of the technical registrants of the Nitroguanidine Neonicotinoids including Bayer CropScience, Mitsui Chemicals Agro, Syngenta Crop Protection, Valent U.S.A, and BASF. Representatives include experts from industry affairs, ecotoxicology, communications, toxicology, and stewardship. Growing Matters Coalition is committed to promoting product stewardship for seed treatments and other uses in agricultural crops, landscape and ornamental plants, turfgrass and pest management (structural, commercial and residential) settings.
Activities to date (September 2021):

- **Executive Summary on Neonicotinoid Stewardship Program** – In 2018, EPA requested a summary of current and future comprehensive pollinator and related stewardship programs from the registrants. The document describes a framework with three pillars: 1) Best Management Practices; 2) Education and Outreach; and 3) Collaboration Networks.

  Resources highlighted in Executive Summary - The below list of resources are available to be utilized for education and outreach that are relevant to stewardship of crop protection products:
  - The Guide to Seed Treatment Stewardship, (www.seed-treatment-guide.com) is a collaborative effort between the American Seed Trade Association (ASTA) and CropLife America (CLA) and is widely distributed and considered to be the industry standard for seed treatment stewardship practices. The website provides resources in the form of written guides and videos on topics such as "Ensuring Success through Stewardship of Treated Seed" and "Treated Seed Stewardship for Managing Seed Spills".

  - The registrants have partnered with the Coalition for Urban Rural Environmental Stewardship (CURES) on a nationally distributed brochure **Insect Pollinators and Pesticide Product Stewardship** (https://www.curesworks.org/pollinators/). The brochure was first released in 2010 and was recently updated in 2018. This brochure provides recommendations and explanations supporting eight key BMPs to ensure pollinators are protected in and around agricultural and urban landscapes. CURES support distribution of both the brochure and video. CURES also has a new brochure released in December 2018 for the Neonicotinoid Product Stewardship Program (https://www.curesworks.org/pdfs/pubs/neonics.pdf).

- **Growing Matters Website**: https://growingmatters.org/
  - Website provides links to resources on the evaluation of the economic and societal benefits of neonicotinoid insecticides to NA agriculture and includes information on the use of neonicotinoids on trees, turf and landscape & production ornamentals.
    - Research Reports https://growingmatters.org/research-reports/
    - Videos for case studies in Citrus, Cotton, and on Emerald Ash Borer https://growingmatters.org/videos/
    - Fact Sheets https://growingmatters.org/fact-sheets/
    - Infographics for Agriculture Research Neonicotinoid Benefits Study & Importance of Neonicotinoids to Integrated Pest Management https://growingmatters.org/infographics/
    - Stewardship links https://growingmatters.org/resources/stewardship/ and communication campaign on stewardship https://growingmatters.org/besure

  - ***BeSure!* Campaign** – https://growingmatters.org/besure Communications campaign encouraging growers and applicators to raise awareness and promote stewardship practices to protect pollinators and other wildlife during the handling, planting, and disposal of treated crop seeds and other neonicotinoid use patterns throughout the growing season.

    BeSure! Campaign was launched in the 2019 growing season with traditional media avenues such as radio segments and content in trade outreach plus resources on Growing Matters website, email blasts, and shareable content on social media platforms. In 2020, the campaign resulted in more than 21.9 million traditional media impressions and 20.8 million radio impressions reaching growers and applicators in 28 states. Impressions are the number of people who could potentially see the ad, story, graphic or video based on it being placed in front of them or shared by someone in their network.

Conclusions

Again, we appreciate the opportunity to comment and have input on the Agency's draft Biological Evaluation (BE) for clothianidin. Our comments here describe our primary concerns related to the draft BE and hope the Agency will consider and integrate this information into the final clothianidin BE.

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